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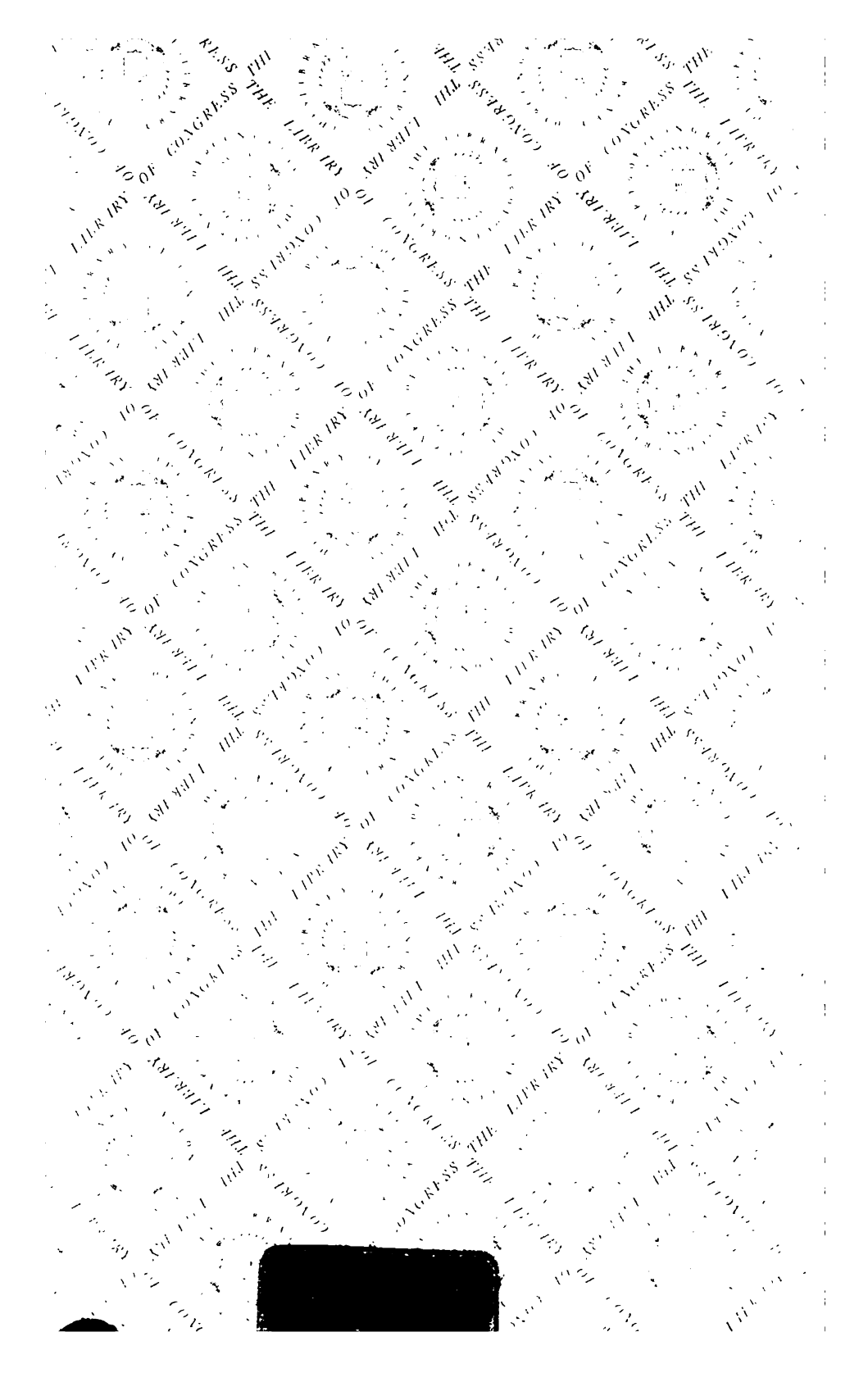
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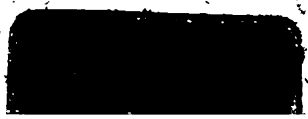
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THE
QUARTERLY
JOURNAL OF AGRICULTURE.

ON THE AGRICULTURE OF THE ROMANS.

THE subject of Roman Agriculture is one of great interest and extent. It is extensive, as it embraces almost as wide a field as the same subject does even at the present day; it is interesting, as forming a system wrought out almost entirely by the perseverance and labour of this extraordinary people; it is instructive also, inasmuch as it presents us with many examples of diligence and economy, and with many practices of excellent husbandry, which, even with all the acquisition of modern times, our farmers would do well to imitate. We excel them, no doubt, in our implements and machinery, but in the various operations of agriculture, whether we regard their knowledge of what ought to be done, or the exactness with which it was executed, they are at all times our equals, and frequently our superiors. Such practices as are common to both, were performed by them with a greater degree of care, and with attention to minuter circumstances which are by us often overlooked. There are many things in their system of husbandry, especially in the management of manure, to which we are still practically strangers. And it is somewhat extraordinary, that, in most of the improvements, which, by the application of experiment and science, have been adopted in modern agriculture, we had long ago been anticipated by the industry of Campania and Latium.

But our eulogy must be confined to knowledge which was strictly practical, and to the careful and practical use they made of it. Science, or philosophy of any kind, long shared little of

their attention ; and the physical sciences were especially neglected. On the conquest of Greece, her arts and civilization were imported into the conquering country ; but her sciences were chiefly metaphysical or mathematical. And the subtle logic and ingenious speculations of the Greek philosophers took a firmer hold of the minds of the Romans, than the attainments which some of their philosophers had made in natural knowledge. They knew nothing of chemistry or physiology, and their progress, therefore, in the practical arts was entirely the result of observation, experience, or accident. Seldom do their agricultural writers attempt to give the *rationale* of the practices they describe ; or, when they do, they commonly fail. Absolute directions are either given, as is usual with Virgil and Columella, or the historical method is adopted, and we are told what is done by certain persons in certain places, as is commonly the case with Varro and Pliny.

But where there is no science to account for the phenomena of nature, they have usually been resolved into supernatural causes. The Romans made few acquisitions in science, and therefore made little change on the casual agency which had been handed down from their ancestors. Superstition entered into all their actions and all their arts, and into none more largely than into agriculture. The spontaneous generation and transmutation of plants, the impregnation of animals by particular winds, the influence of lunar days and other such things, are stated by their agricultural writers as facts which no one doubted. It is curious to notice part of the religious economy of Cato ; after ordering the master of the family to be regular in performing his devotions, he expressly forbids the rest of the family to perform any, either by themselves or others, as they were to consider that the master performed sufficient devotions for them all. This was probably with the view of saving time, and also from an apprehension, that some slaves, with more susceptible imaginations, might become religious enthusiasts.

The sources whence our information is derived on the subject of Roman agriculture, are the six Roman authors who have treated of this subject, and whose works have come down to us—Cato, Varro, Virgil, Columella, Pliny, and Palladius. Cato

the earliest of the Roman writers on husbandry, lived in the seventh century of Rome, and died at an extreme old age, B. C. 150. He distinguished himself at the age of seventeen, in a battle against Hannibal, and afterwards rose through all the honours of the state. He obtained the name of Cato the Censor, by the impartiality with which he discharged that office, by the remarkable severity of his own morals, and by the opposition which he gave to all luxury and dissipation. He wrote several works, some fragments of which only remain, under the titles of *Origines* and *De Re Rustica*. The latter is the oldest Roman work on agriculture, and is rather more valued for the account which it gives of Roman customs and sacrifices, than for its agricultural merits.

M. Terentius Varro, died B. C. 28, in the eighty-eighth year of his age. Besides being a distinguished soldier both by sea and land, and a consul, he was a grammarian, a philosopher, a historian and astronomer, and is said to have written 500 volumes on different subjects, none of which, except his treatise *De Re Rustica*, are extant. This is a complete system of directions on the proper seasons for, and on the various departments of, rural labour; on the management of live stock also, and on the villa and offices. As he was for some time Lieutenant-General in Spain and Africa, and afterwards retired to cultivate his own estate, his experience and observation must have well fitted him for the task he undertook.

P. Virgilius Maro was born at a village near Mantua, in Lombardy, about 70 B. C., and died in the fifty-second year of his age. He cultivated his own estate till he was thirty years old, and spent the rest of his life chiefly at the court of Augustus. His *Georgics* form a poetical compendium of agriculture, taken from the Greek and Roman authors then extant, but chiefly from Varro. Columella was a native of Gades, now Cadiz, in Spain, but spent most of his life in Italy. He is supposed to have lived under Claudius in the first century. His work *On Rural Affairs* is a complete treatise on the subject, including the management of timber-trees and gardens.

Pliny, surnamed the elder, was born at Verona, in Lombardy, and perished at the same eruption of Mount Vesuvius which overwhelmed Pompeii, A. D. 79, in the fifty-sixth year of his age. He

was of a noble family; he distinguished himself in the field and in the fleet, and was for some time governor of Spain. None of his numerous works remain except his *Natural History*, in thirty-seven books, which is full of the learning of the times, accompanied with much that is useless, frivolous, or erroneous. It treats of every art and science, and of every subject that could be comprehended within the range of natural history. It may be considered as a compendium of all that had been said by preceding writers on the subject, with the fruits of his own extensive experience and observation.

Palladius, the last of the Roman writers on agriculture, is supposed by some to have lived in the second, and by others in the fourth, century. His work *On Rural Affairs* is a poem in fourteen books, and is little more than a compendium of the works of preceding writers. It has been characterized as too dull to be read as a poem, and too concise to be useful as a didactic work.

From the writings of these Roman authors, a judicious treatise has been composed by the Reverend Adam Dickson, and published in 1788, under the title of "The Husbandry of the Ancients," to which we are indebted for the greater part of what we are about to submit on the subject of Roman Agriculture. Of these writers Mr Dickson observes, that, "instead of schemes produced by a lively imagination, which we too often receive from authors of genius, unacquainted with the practice of agriculture, we have good reason to believe that they deliver in their writings, a genuine account of the most approved practices,—practices, too, the goodness of which they had themselves experienced."

As the subject is extensive and complicated, we shall arrange it under the following heads:—first, The Proprietorship and Occupancy of Land; secondly, The Soil, Sun, and Climate of Italy; Thirdly, Culture and Farm Management; and, fourthly, The Produce of Roman Agriculture.

I.—Of the Proprietorship and Occupancy of Landed Property.

The Roman nation originated, as is well known, from a company of robbers and runaway slaves, who placed themselves under Romulus. This chief having founded the city, and conquered a small part of the adjoining territory, portioned it out

among his followers, and, by what is called the Agrarian Law, allowed no citizen to hold more than two jugera, or one and a quarter English acre. A portion of land was thus put into the hands of each, which he was able completely to cultivate, and on which he depended for subsistence. When agriculture was in its infancy, and little or no enterprise could be directed to its improvement, no plan could have been more effectual for increasing the productiveness of the soil, by all the means which their limited knowledge could command. Then, too, and for some centuries afterwards, every citizen, both in town and country, was a soldier, and being therefore trained to regular and systematic habits of action, he would naturally carry these habits into whatever he undertook. A bolder and more active industry, as well as greater order and economy, would be directed to the operations of husbandry by such a military agriculturist, than could have been expected from an ordinary farmer. This is confirmed by an observation of Pliny, that, in early times, the Roman citizens "ploughed their fields with the same diligence that they pitched their camps, and sowed their corn with the same care that they formed their armies for battle." By the marches and journeys likewise, which, as a Roman soldier, he had often to take, he would become acquainted with the customs and practices of others, and would not only gain directly by adopting what he observed superior to his own, but, what is more important, he would be in some measure liberalized and emancipated from that invincible adhesion to established usages, which is usually strong in the cultivators of the soil, and has often retarded the progress of agriculture.

After the expulsion of the kings a second Agrarian law was passed, by which seven jugera, or about four and a half English acres were allotted to each citizen. This long continued to be the portion assigned to each in the division of conquered lands; and many of their most eminent generals, as Quintius Cincinnatus, Curius Dentatus, Fabricius, Regulus, and many others, strictly confined their farms to the legal size. Curius Dentatus, after the taking of Tarentum, as a reward for his great services during the war, was offered fifty jugera by the Senate, but he declined them, and accepted only the portion of a common soldier. It may be observed, that, under the operation of both these laws, their

lands must have been cultivated with the spade, since a whole farm would scarcely have been sufficient for the maintenance of a single yoke of oxen. And Regulus, in his letter from Africa to the Senate, mentions on his farm of seven jugera, a bailiff, a hired servant, and two labourers, but no oxen; and, had the plough been used, one labourer would certainly have been sufficient.

Although, in the division of lands, an equal portion was assigned to each, it soon came to be in the power of the wealthier citizens to increase it by purchasing more. When each soldier had received his share of a conquered territory, the remainder was divided into lots, usually of fifty jugera, and sold by the quaestors. The spirit of the Agrarian law, therefore, which was to preserve a kind of equality, soon came to be, in a great measure, set aside; and the estates of the richer citizens, by the frequent additions they received, soon increased to a size that awakened the resentment of the people and their tribunes. A law was, in consequence, passed, at the instance of Licinius Stolo, that no one should possess more than 500 jugera. Its execution commenced with impartial rigour, as Stolo himself was condemned for transgressing its limits, though the excess was held in the name of his son. It continued, likewise, long to be strictly enforced, as appears from a remark of Pliny, who, when mentioning the prices of corn in ancient times, observes, that, in the time of Metellus, a modius of *far* was sold for an *as*, and that this low price could not be accounted for by the largeness of estates, since, by the law of Stolo, no one could possess more than 500 jugera. Each estate, whatever was its size, was held by the proprietor as an absolute right, with no acknowledgment to any superior power, and passed to his successors by testament, if he made one, or, if not, to his nearest relations, by common law.

It was anciently the pride of Roman virtue, that each proprietor should cultivate his own land, except when employed in the service of the state, but on the increase of wealth, and the gradual widening of different ranks, agriculture was committed to different hands, and managed by farmers or servants as in modern times. Those who retained the management of their own grounds, employed villici, or overseers, to superintend their

cultivation, who were usually either freedmen, or a kind of confidential slaves. Such proprietors had commonly both houses in the town and villas in the country. Though their farming operations were committed to others, they did not neglect, in the time of Cato at least, the interests and improvement of the country. The minute acquaintance which he requires of them respecting the whole management and productions of the farm, could we consider it as at all like a description of the degree of information usually current among proprietors, shows the extraordinary degree of care and attention bestowed by the higher classes of the Romans on agricultural affairs. The passage is so good in itself, and so characteristic, that we shall extract a part of it. "After the landlord," says Cato, "has come to the villa, and performed his devotions, he ought to go through his farm, that very day if possible, or at least on the next. When he has considered in what manner his fields should be cultivated, what work should be done, and what not done, next day he should call the bailiff, and inquire what of the work is done, and what remains; whether the labour is sufficiently advanced for the season, and whether any thing remains that might have been finished; and what is done about the wine, corn, and all other things. When he has made himself acquainted with all these, he should take an account of the workmen and working days. If a sufficiency of work does not appear, the bailiff will say that he was very diligent, but that the servants were not well, that there were violent storms, that the slaves had run away, or that they were employed in some public work. When he has given these and other excuses, call him again to account on the same subject. When there have been storms, inquire for how many days, and consider what work might have been done in rain; casks ought to have been washed and mended, the villa cleaned, corn carried away, dung carried out, a dung-hill made, seed cleaned, old ropes mended, new ones made, and the servants' clothes mended. On holidays, old ditches may have been scoured, a highway repaired, briars cut, the garden digged, meadows cleared of weeds, twigs bound up, thorns pulled, far (bread-corn) pounded; all things made clean. When the servants have been sick, the ordinary quantity of meat should not have been given them. When he is fully satisfied respect-

ing all these things, and has given orders that the work that remains be finished, he should inspect the bailiff's accounts of money, corn, fodder, wine, oil; what has been sold, what remains, what of this may be sold, and whether there is good security for what is owing. He should buy what is wanting for the year; give orders concerning the works he wishes executed, and leave his directions in writing. He should inspect his flocks, make a sale, sell the superfluous oil, wine, and corn, if they are giving a proper price, sell the old oxen, the refuse of the cattle and sheep, wool, hides, old carts, old iron tools, and old and diseased slaves. Whatever is superfluous he ought to sell; a farmer should be a seller not a buyer."

The influence and example of men so high in rank and authority, form another cause which tends to account for the progress which agriculture made among the Romans. When they engaged themselves in its operations, they would heighten the character and respectability of the profession, and of all who engaged in it. And every improvement which they made or introduced, would speedily descend among all classes of husbandmen. In the time of Varro, however, it appears that they had considerably relaxed in the application which they bestowed on agriculture, as he complains that they resided too much within the walls of the city, and spent more of their time in the theatre and circus than in their cornfields and vineyards.

Many of the proprietors, requiring frequently to be in Rome, or at a distance from their estates, and being unable to exercise the necessary control over their stewards, would find it advantageous to give them an interest in the prosperity of the farm, by allowing them to share in its profits. This, therefore, was the next step in the division of agricultural labour. The stock on the farm was the property of the landlord, and the farmer received a certain proportion of the produce. A farmer of this description was called *Politor*, or *Partiarius*, the one implying that he was a dresser of the land, the other, that he shared in its produce. The portion assigned to the *politor* varied with the productiveness of the soil. On the rich lands of *Venafrum* and *Casinum*, he received only one-eighth or one-ninth; on inferior soils one-sixth, and sometimes even one-fifth. From the small share of the *politor*, it is evident that he defrayed no part of the

expense of cultivation, and that the seed, cattle, and utensils, were all provided by the proprietor. In ancient Egypt the king was accounted the proprietor of the soil; the farmers held it of him, and paid him one-fifth part of the produce as rent. In Britain, also, land has sometimes been let on this system, but, instead of one-sixth, the share of the Roman politor, that of the British farmer is three-fifths; two-fifths being the rent paid to the landlord, including the tythes. The tenant, however, in this case, provides the stock, and defrays all the expense of cultivation.

The politor, as his income (which, on farms of the usual size, would be about 182 bushels) would lead us to expect, was a person of inferior condition, of whom little knowledge was required, and who, in regard to the method of culture, was entirely under the direction of the landlord. This was, in some measure, necessary, where the interest of the latter so much exceeded that of the former. The occasional presence, too, of the proprietor, and an outlook after the proceedings of the politor, especially during the collecting and partition of the produce, were still necessary, and would be irksome to those who were devoted to the pleasures of the town. "A farm," says Columella, "on which the landlord cannot be present, ought to be let." Another, and the highest description of tenants accordingly arose, who paid a certain rent, and defrayed all the expenses of stock and cultivation, as the farmers do in this country. But though the proprietors had now got all the interest of the cultivator involved in the most profitable cultivation of his land, they were extremely averse to intrust him with the mode of doing so. He was laid under minute and rigorous restrictions, which extended not only to the rotation of crops, but to the particular culture which each was to receive.

The instructions of Columella to landlords concerning the mode of treating their tenants, are both curious and important, and are not very different from language which they hear, or may hear, at the present day. A landlord, he says, ought to treat his tenants with gentleness, should show himself not difficult to please, and should be more rigorous in exacting culture than rent; for where a field is well cultivated, it usually brings profit, and the farmer cannot have the assurance to ask any

abatement of his rent. Neither should the landlord be very tenacious of his right in every thing to which the farmer is bound, particularly as to days of payment, nor ought every penalty in his power to be exacted, for our ancestors were of opinion, that the rigour of the law was the greatest oppression. Nor, on the other hand, ought he to be entirely negligent in this matter; for it is true, as Alphius the usurer used to say, that good debts become bad ones by not being called for. It was reckoned most advantageous for an estate to be cultivated by farmers who were natives of the country, and born upon the lands, for these are strongly attached to it from their cradles. Frequent letting was thought a bad thing, but it was still worse to let land to a farmer who lives in town, and cultivates it by servants, as from such a farm, it was said, a lawsuit was got instead of rent.

From these directions of Columella, it appears, that the landlord was considered as understanding every thing concerning the husbandry and management of his estate himself, and that there was no agent or factor between him and the farmer. The farmers, though strictly bound to a particular kind of culture by the conditions of their lease, seem otherwise to have been very independent of their landlords, so much so, as sometimes to enter into lawsuits with them. They appear to have been, on the whole, on a footing very similar to that of the modern farmers of Britain.

II.—*Of the Climate, Surface, and Soil of Italy.*

Poets and travellers, from the earliest times, have united in celebrating the pure air and cloudless sky of Italy. In spring and autumn, these praises are deserved; but, in summer, it is parched by excessive heats, and subject also to severe storms of hail, which often do considerable injury. In winter, frost and snow prevail on the mountains, but rarely occur on the plains. At the close of the year, however, immense torrents of rain fall, often with little interruption, for weeks together. On the campaign lands and gentle declivities, the vine, the fig, and the olive, ripened anciently, as they do now, in open plantations, from one extremity of Italy to the other.

The *surface* of Italy, as is well known, is very irregular, a

ridge of mountains passing throughout its whole length, and giving off numerous hills and valleys of various extent and fertility. The finest agricultural district is the plain of Lombardy, watered by an immense number of streams from the surrounding mountains, which are collected in numerous canals, and irrigate almost every farm. This system of irrigation was practised also, though not to an equal extent, in ancient times. The district of Tuscany is every where mountainous, and, to all appearance, the most uninviting to the agriculturist, but, by labour and perseverance, has been rendered highly productive, both in ancient and modern times, though the *terrace system*, which is now so successfully practised there, seems to have been unknown to the Romans. The rich plains of ancient Campania, now the Campagna of Naples, form an interesting feature towards the south. The heat of the sun is there so great, that it is found necessary to shade the grain from its influence; and, to effect this, the ancient practice of intersecting the fields with rows of elms and willows, still prevails.

The soil of Italy is as varied as the surface. The plains of Lombardy are distinguished for their deep rich loam and marly clay. The soil on the east coast, from Venice to Florence, is composed of a blue clay, containing sulphur and alum, and the Campagna of Rome and Naples, chiefly of a kind of volcanic earth. The attentive observation of the Romans carefully marked the different varieties of soil, classed them according to their nature and situation, and described the cultivation and crop to which, from both circumstances, they were best adapted. They enumerate six kinds of soil, rich and poor, free and stiff, wet and dry. That which was rich, and at the same time free, was accounted the best, requiring the least culture, while it afforded the largest increase. When other circumstances were alike, a preference was usually given to wet land over dry. In Britain, at least in the northern parts of it, an opposite choice would at once be made; but it must be observed, that Italy had a much drier and warmer climate, and that its soil is generally not so strong and stiff as that of this country.

The best soil was called *Tenera* or *Pulla*, and its various properties are, that it has a blackish colour, that it is glutinous when wet; "when tossed by the hand," says Virgil, "it does

not crumble, but sticks to the fingers like pitch, but that it easily crumbles when dry;" that it imbibes water, retains a proper quantity, and discharges a superfluity; that, when ploughed, it exhales mists and flying smoke; that it does not injure the plough-irons with salt rust; that the ploughman is followed by rooks and crows; and that, when at rest, it carries a thick turf of grass. The quality of being glutinous when wet is still, or was at no very distant period, used in Italy as a test of the excellence of the soil; and the property of imbibing water, without being injured by excess, is the most distinguishing character of the finest land in this country.

There is a certain saltness or bitterness in the earth, which all the ancient authors speak of as causing barrenness wherever it exists, and as being extremely difficult to remove. A simple experiment was used to ascertain its existence. A thick woven basket was filled with some of the suspected soil, mixed with water. "The taste of the water which drops from it," says Virgil, "will afford a certain proof, and, by its bitterness, distort the offended countenance of the inquirer." This experiment likewise still continues to be made for the same purpose in modern Italy. It may seem unaccountable, that while, in modern times, salt has been regarded by many as a fertilizing manure, among the ancients its existence in the soil always implies the strongest description of barrenness. Thus, in Scripture, to sow a country with salt, is a strong expression to denote that the country shall be rendered utterly unproductive. Salt, however, according to Sir H. Davy, when applied in moderate quantities, forms an active manure, but, when given in too great abundance, or when the soil has been completely impregnated with it, as is the case with some of the plains of Syria, barrenness is the consequence.

The artificial state of the country, in regard to agriculture, under the Romans, seems not to have differed much from its present state. The cultivated lands were open, and enclosures were to be seen only near the villas. These enclosures consisted chiefly of gardens, orchards, and parks for game, which were kept by the wealthy. With the exception of Tuscany and Lombardy, the state of the country, with respect to enclosures, is still much the same; and the landscape which Pliny describes

as seen from the villa, does not appear to have been different two thousand years ago from what it is at present.

III.—*Culture and Farm Management.*

The state of a farm, which Cato and some of the other agricultural writers, think the most advantageous, is that of pasture and watered meadows, as yielding their produce at the least expense; and that of vines and olives, as being most productive in proportion to the expense of culture. Their opinions, however, seem to vary on this subject, apparently confounding the produce and profit of meadows, which required little or no cultivation, and those of land under crop, which, with superior cultivation yielded a high return, but a poor one if imperfectly farmed.

The villa of the Romans originally denoted the farm house and its offices. These, in the infancy of the Commonwealth, were plain and small, suited to the manners of the people, and to the size of their farms. . . . But, when they had extended the limits of their empire, and wealth and property had accumulated in the hands of their nobles, their villas became proportionally large and magnificent, so as sometimes to cover a wider space than the whole estates of the ancient senators. It would appear, that, in the time of Cato, they had begun considerably to extend their villas, as he repeatedly cautions proprietors of land not to be rash in building; but advises them to plant and sow in their youth, and not to build till somewhat advanced in years. From the earnestness and decision with which he expresses himself on this subject, it would appear that he had in view some young noblemen, who had ruined their estates by the extravagance of their villas. At thirty-six years of age, the period when he allows them to build, it might be supposed they would proceed with more prudence and moderation. The villa was to be proportioned to the size of the farm. It was too large if, should any accident destroy it, it could not be rebuilt by one, or at most by two years' rent of the farm; and it was too small, if insufficient safely to preserve all the corn and fruits of the farm. Lucullus, it is observed, built his villa greatly too large, and thereby exposed himself to the chastisement of the censors, for having occasion to spend more time in sweeping his house than in ploughing his land.

In the position of the villa, they all advise that it should not

front a marsh or a river; such a situation being cold in winter, and unhealthy in summer. With an east or south-east exposure, the foot of a mountain covered with wood, was thought the most eligible site; the master's house standing a little higher than the rest of the villa, that its situation might be drier, and that it might command a more agreeable view. A highway, according to Columella, should especially be avoided, because it is there exposed "both to the ravages of travellers, and to the continual visits of those who are on jaunts of pleasure." The villa was divided into three parts, the *urbana*, the *rustica*, and the *fructuaria*; and great care was taken to place them in the most convenient relation to each other. The *urbana* contained the apartments of the landlord; the *rustica* consisted of the kitchen, the houses of the labouring servants, the stables, &c.; the *fructuaria* included places for the oil and wine presses, the oil and wine cellars, the barn, granary, repositories for roots and fruits, &c. Adjoining the *rustica*, stood the aviary, apiary, a place for dormice, a warren for rabbits and hares, a place for snails*, and a large enclosure or park of about fifty acres, for goats, deer, and other beasts of the chase.

The *servants* employed in Roman agriculture consisted of freemen and slaves. When the proprietor or farmer resided on the farm, and himself directed its culture, they were all under his own superintendence; and, to the bailiff, when such was employed, they were all subordinate. The latter was commonly a person who had received as much education as enabled him to write and keep accounts; though, according to Columella, he may make an excellent bailiff, even though too illiterate for this, because he is then afraid to give credit, and will bring money to his master oftener than his books. He is, on all occasions, strictly prohibited from employing his master's money in any speculation of his own, or trading at all on his own account, as this would divide his attention and interest, which should be wholly in his master's business.

In the directions which this author gives respecting servants,

* Snails formed an article of food among the Romans, and were even esteemed as one of their luxuries. They are likewise still used during Lent in several parts of Europe.—The edible species, and that which was used by the Romans, is the *Helix pomatia*, which is found in the south-western counties of England, but not in Scotland. Our common snail is the *H. aspersa* of naturalists: it is sometimes sold in Covent-Garden market, but is very inferior to the other.

and the department of work to which each was assigned, according to his strength, genius or size, we observe the extraordinary, though sometimes trifling minuteness, with which the Romans treated every branch of husbandry. Where any charge of work was given, the careful and industrious were chosen, without any respect to stature or strength. In the ploughmen, however, though a degree of genius is necessary; yet this is not enough; there should be likewise a harshness of voice and manner to terrify the cattle; because he should be more terrible than cruel. Talness, also, was considered of great use in a ploughman, though of very little in a master of works. The common labourer might be of any size, provided he is able to endure fatigue. The vine-dresser was not required to be tall, but to be thick and brawny. A strange observation is added, the premises of which we may surely question, that "wicked men are commonly of a quicker genius, which this kind of work requires, and as the workman must be both stout and of an active contrivance, vineyards are commonly cultivated by slaves in chains."

Very little is known respecting the wages of labour by merely ascertaining the sum which is paid, unless we compare it with the price of other commodities. The price of a slave in the time of Cato was about L. 50; in that of Columella, it had risen to L. 60, or to the value of about eight jugera, nearly five and a half English acres of good land. The interest of money was at this time 6 per cent.; but in estimating the expense of labour, the price of a slave, as he is a perishable commodity, cannot be rated lower than 12 per cent; so that one, purchased at L. 60, must be reckoned as costing his master L. 7, 4s. per annum, besides his maintenance and clothing. From this, some idea may be formed of what would be the wages of a free servant; but these do not seem to have been numerous, as their wages are not even mentioned. The slaves were all maintained and clothed by the farmer or proprietor; and, in regard to this, they were carefully and liberally treated. It was an old maxim, that the bailiff should never eat but in presence of all the servants, nor of any thing but what was given to them; for this reason that, in these circumstances, he would be always careful to have the bread well baked, and the provisions wholesome.

and well prepared. The master is advised to be particularly attentive in inquiring respecting the treatment which the slaves received from the bailiff, masters of works and goalers; because should they either be treated with unnecessary severity, or be deprived of any of their allowances, it both lessened their value as workmen, and rendered them dangerous. In their dress, greater attention was paid to comfort than to neatness; their clothes were such as completely to secure them against cold and rain, and consisted of sleeved leathern coats, *centones* for covering their heads, (which were made of a thick stuff used for bed quilting, or often of their old coats), or cloaks with hoods. A new coat, gown and shoes, were given them once in two years.

The price of agricultural labour among the Romans, seems to have been fully equal to what it is now in Britain; it may appear less when stated in money, but when compared with the price of corn and land, and taking into account the manner in which their slaves were clothed and fed, the expense of one was rather higher than that of a farm servant at present. From the necessity of purchasing slaves, the outlay of capital, which a Roman husbandman had to make in entering upon and conducting a farm, was much greater than in Britain or any other country, where the labourers are not bought, but where they receive wages, or what is only the annual interest of their value. Our farm-servants, who are usually paid from L. 15 to L. 20 a year, besides food and lodging, if they were to be purchased, would cost the farmer from L. 150 to L. 200 each. A farm therefore of three hundred acres which would employ a capital of L. 8000 and six servants, would, if these servants were purchased, require an additional capital of at least one-third.

Of Beasts of Labour.—These, among the Romans, as among all ancient nations, were chiefly oxen, sometimes the ass and mule for burdens, but rarely the horse. The respect in which the ox was held among the Egyptians, Jews, and Greeks, was continued among the Romans; he was considered the companion of the husbandman; and almost all their writers record an instance of a man having been indicted and condemned for killing one to gratify a wanton boy who longed for a dish of tripe. In

breeding both horses and cows, the form of the female was chiefly attended to, and was thought to have the greatest influence on the symmetry of the offspring. Different opinions have been held on this subject in modern times, but that which is now approved of by the most experienced breeders, is, that while attention to the form of both parents is requisite, that of the male, contrary to the opinion of the Romans, is the most important; and an argument in favour of this doctrine may be drawn from an observation of the Romans themselves respecting mules, that those bred from an ass and a mare had more of the character and appearance of the ass, and that those from a horse and an ass had more of the character and appearance of the horse.

They were so anxious to have their oxen properly trained, that they commenced their education when calves. "Calves," says Virgil, "which you intend for labour, should be instructed while their youthful minds are tractable; first encircle their necks with wide wreaths of tender twigs, and afterwards put real collars upon them." Before being yoked, they were tied for a few days between two stakes, and then put into the plough along with a veteran, or, if refractory, between two. Some oxen, Columella observes, are disposed to lie down in the plough, and stripes will be applied in vain; but when they do this, he advises the ploughman to bind their feet so as to prevent them from rising, walking, or feeding; and hunger will soon effectually cure them. Both in the cart and plough they were yoked in pairs, and were carefully matched, that the stronger might not overwork the weaker. They were yoked either by the horns or by the neck; but the latter mode was greatly preferred, the former, according to Columella, being condemned by almost all who have written on husbandry. From a remark of Homer, "that from around the roots of the oxen's horns much sweat breaks forth," it appears to have been customary in Greece, in his time, to yoke them by the horns. When in the plough the Roman farmers were careful not to overwork them. Their furrows were short, 120 feet being the length of the breaks into which the land was divided; and it was thought too severe for them to pull hard, without resting, a greater distance than this. At the end of each furrow they were allowed to halt a little,

when the ploughman lifted forward their yokes that their necks might cool. After they are unyoked, he is enjoined to rub well their necks and backs, to pour wine into their mouths if they are warm, to give them no food till they cease from sweating, and then only in small portions, and afterwards to lead them to the water and encourage them to drink by whistling.

In purchasing working oxen, the farmer is directed to choose such as have "spacious horns, a broad forehead, wide nostrils, a broad chest, and thick dewlaps." The hair of their cattle, they observe, should be short and thick, the skin very soft to the touch, and the body in general compact and square. The particular parts they describe with great minuteness, and generally in such terms as would be approved of by experienced breeders in modern times, making allowance for the different properties which are admired in an ox which is to work, and in one which is to be fed. All their authors concur in advising the farmer to rear at home, if possible, all the cattle he requires, or to be very careful in choosing them from a soil and climate similar to that on which they are to work.

Asses and mules were also used, though less frequently, in agricultural labour. The ass was chiefly employed in carrying burdens, in the mill, and occasionally in the plough where the land was light. Mules are recommended both for the road and the plough, where the land is not stiff, and when their price is not too high. Horses were scarcely, if at all, used in Roman agriculture, but they were reared by many farmers for the saddle, for the chase, or for war. Very full directions are given by Varro and Columella, respecting the choice of mares, and the best mode of rearing their young; but as these do not contain much that is remarkable, and are rather unconnected with agriculture, we shall not enter into any detail of them.

Implements of Husbandry.—Of these the Romans had a great variety, but their particular forms are so imperfectly described, that little is known with certainty respecting them. Commentators too are divided in their interpretations of the passages in which they are described, and their commentaries are usually the more obscure, as most of them have been unacquainted with practical husbandry.

The most important of these implements was the plough, in the construction of which they do not appear to have attained much skill. Two kinds of ploughs are mentioned, one for stiff and the other for light soils; the former appears to have had an iron share, the latter a piece of timber covered, like most of the wooden ploughs in this country, with a share or sock. Another kind of plough, which was used for covering seed, and forming fields into drills, had two mould-boards. They had a sufficient variety of ploughs, though, perhaps, not very scientifically constructed. "They had," says Mr Dickson, "ploughs with mould-boards and without mould-boards, with and without coulters, with and without wheels; with broad and with narrow pointed shares, and with shares not only with sharp sides and points, but also with high cutting tops." The plough which was in common use for merely stirring the soil, had no coulter or mould-board. To supply the place of the latter, the plough had either a stick inserted into the share-head, and diverging on each side, or it was held obliquely towards the side to which the earth was to be turned. It must be observed, that they did not plough their fields in ridges, by circumvolving furrows, as we do, but, both in going and returning, laid the furrow in the same direction, merely by inclining the plough.

Wheel ploughs are supposed to have been invented not long before or about the time of Pliny, who attributes the invention of them to the inhabitants of Cisalpine Gaul. They seem to have been known to the Greeks, and some figures of them are found on their monuments of antiquity. Wheels formed no part of the plough in common use among the Romans, and wheel-ploughs of any kind seem not to have been in great request. They are much more easily guided by the ploughman, and appear to have been introduced to assist his want of skill and experience. They are extensively used in Britain, in ploughs for surface-dressing, and have been attempted also in the common plough; but, besides their own additional friction, even on the smoothest ground, they are liable to so many obstructions, that they considerably increase the draught of the horses.

The *irper* seems to have been a plank with several teeth, used as our break on rough ground to break the clods, and to tear out

weeds. The *crates* seems to have been an improvement on the preceding, made in the form of a harrow, drawn by oxen, and used for the same purpose with the *irpex*. The *rastrum* was a rake, employed in manual labour, as we do rakes in gardens, and likewise in their corn-fields, both for breaking clods and covering seeds. The *sarculum* was a hand-hoe, used as we do that instrument. It seems, however, to have been somewhat different in its form from ours, as it was often employed as a rake for covering seeds, and for breaking clods in fields and gardens. It was so constructed also, as to be used for destroying weeds among growing corn, which, for the purpose of being hoed, was sown in drills.

As the fields of the Romans were usually intersected with stripes of trees, instruments were necessary both for pruning them, and for cutting their roots when they interrupted the culture of the ground. Of these, the *securis* and *dolabra* are frequently mentioned. The former seems to have resembled our axe, and to have been used in the same manner. The same term, however, was also applied to the blade of the pruning-knife, which was in the shape of a crescent. The *dolabra* was a kind of adze, used by the ploughman, for cutting the roots which interrupted the plough. The *securis* and *dolabra* were sometimes united, the *securis* on the one side, and the *dolabra* on the other ; and the compound instrument was called *securis-dolabrata*.

Two kinds of scythes were in use among the Romans ; the Italian was short, and manageable among bushes ; with it the mower cut low, and used only his right hand. The Gallic scythe was long, somewhat similar to ours, and used nearly in the same way. The Roman reaping-hook seems not to have been very different from that which is in modern use. Some were used for merely cutting off the ears of the corn, which probably were not serrated ; others, for cutting wheat and barley near the ground, resembled our common sickles. We are informed by Pliny and Palladius, that, in the south of Gaul, a reaping-machine had been invented, which, from their description, was not unlike some modern attempts at such an engine, and must have nearly resembled a machine which has been used in Suffolk, for cropping off the heads of clover when left for seed.

“ In the plains of Gaul,” says Palladius, “ they use this quick mode of reaping ; and, without reapers, cut down large fields of corn in a day. A machine is carried upon two wheels, the square surface of which has boards erected at the sides, which slope outwards. The board on the front is lower ; and, on it there are a number of teeth, set wide in a row, turned upwards at the end, and answering to the height of the ears of corn. An ox is yoked to two shafts placed behind, with his head to the machine. When it is pushed forward through the standing corn, all the ears are comprehended by the teeth, and cut off from the straw, which is left behind. The driver can set it higher or lower, as he finds necessary. It does very well when the fields are smooth, and when there is no necessity for feeding with straw.” This machine, it is not improbable, may have merely pulled or *rippled* off the ears, between the teeth, like the iron-comb or ripple, by which the seed is forced from the stalks of lint ; but if it was really so contrived as to cut the straw, it would certainly be extraordinary that, among the rude tribes of Gaul, an invention should have been made, which, with all the light of modern science and mechanical skill, we have yet scarcely, at least but very lately, surpassed. It is little more than twenty years since the first effectual attempt was made in this country at constructing a reaping-machine. Various contrivances and improvements, however, have since been made ; but the most efficient instrument that has been yet produced, is the very ingenious contrivance of Mr Patrick Bell, which has been described in a previous number of this Journal, and the efficiency of which has already been tried.

Agricultural Operations.—The most important of these are ploughing, fallowing, manuring, irrigating, sowing, weeding, and reaping. *Ploughing* was held in due estimation among the Romans, and very full instructions are given respecting the mode of conducting the operation ; but as they contain little that is interesting or remarkable, we shall proceed to the subject of fallowing.

Fallowing constituted a most important part of Roman agriculture, and was thought an essential preparation for almost

every crop, their usual rotation being a crop and fallow in succession. The same, or nearly the same system, still prevails in Switzerland, and some parts of the south of France, where it was probably introduced from the Roman practice. It seems to have arisen from an idea, that the earth was exhausted by carrying a crop, and required a year's rest before producing another. And this idea was confirmed by an analogy which they thought they observed in the olive-tree, which, it is said, bore a good crop only once in two years, and never two in succession; but for this Varro accounts from the destructive way in which the fruit was gathered. Though this was their established and regular rotation, they sometimes ventured to take two crops in succession, a crop of grain after one of pulse,—the latter being supposed rather to improve than injure the soil.

Frequent fallowings are usually the resort of a rude husbandry; proceeding either from the abundance of unoccupied land, with no demand for its produce; or from a want of capital, to procure implements and labourers for preparing the soil during the interval between two annual crops, or to purchase cattle to consume the straw, and form a supply of manure. But none of these causes are applicable to Roman agriculture. From the subdivision of their lands, every part was turned to the most profitable account; from their estates being chiefly cultivated by the proprietors themselves, the soil had the command of almost all the capital of the commonwealth; and nowhere has greater attention been paid to the accumulation of manure. We can account for such a practice among such husbandmen as fallowing every alternate year, only by carrying back its establishment to a ruder period of their history, and leaving it to rest on the inveteracy of an ancient habit.

In their system of fallowing, they differed widely from the opinions and practice of this country. It is thought by many, that, under a diligent cultivation, and a sufficient application of manure, fallowing is altogether useless, and an unnecessary loss of a crop; and this doctrine has the support of a late much distinguished philosopher. This, however, appears to be a contrary extreme. Many of the objections against fallowing have arisen from an ignorance of what it really is, when properly conducted. In many parts of Britain, at least formerly, and like-

wise in France, fallow was merely a piece of land allowed literally to rest for a year without a crop, except an abundant growth of weeds, and without culture, unless one or two ploughings can be called so. But it need not be observed, how different this is from the mode of fallowing which is pursued in the best cultivated districts of Britain. The opinion which now obtains on this subject among the most experienced agriculturists, and which was illustrated in a late number of this Journal, is, that, on free land, which is adapted for green crops, fallowing may be profitably dispensed with, but that, on clay soils, on which green crops cannot be advantageously raised, it is still indispensable.

When land was to be fallowed, it was first ploughed, usually in August, as soon as possible after the crop was removed: it was cross-ploughed in spring, and a third or fourth time before sowing. At the third ploughing, or that which immediately preceded the sowing, the field was commonly formed into small drills, two furrows being thrown upon each other. In this state it was sown, and the seed ploughed in by reversing the drills. There was, however, scarcely any limit to the number of ploughings and harrowings which the fallow received. It was wrought till completely pulverized and cleared of weeds, and was considered ill fallowed if it required any harrowing after being sown. Three ploughings, however, besides the seed-furrow, were, on ordinary occasions, reckoned sufficient; and this, according to Theophrastus and Homer, was likewise the number usually given in Greece. The advantages of a winter ploughing, when the weather would admit, are strongly enforced; and it is observed by Virgil, that "both the corn and the fields are most joyful in winter dust,"—an observation not unlike the modern proverb, founded on the utility of dry weather in winter and spring, that "a peck of March dust is worth its weight of gold." Winter ploughing seems likewise to have been valued by the eastern nations, as its importance is strongly expressed in one of the aphorisms of Solomon, "The sluggard will not plough by reason of the winter, therefore will he begin harvest and reap nothing."

Four ploughings seem to have been very regularly given, with the addition of more, when required; and it is both an

evidence of this, and might ensure a stricter observance of these ploughings, that of twelve deities, who presided over agriculture and were invoked at the feast of Ceres, four presided over the department of ploughing. One had charge of each of the four separate ploughings, and the order in which they were invoked, describes the management of fallow.

The fallowing of the Romans will not suffer by a comparison with that of modern times, scarcely even with its most improved state, under the management of the British farmer. In those parts of the country where fallowing is best understood, from four to six ploughings are usually given with frequent harrowing and rolling between. The first is given as soon as possible after harvest, when the ridges are gathered up, and in that state lie dry during the winter months. Immediately after the spring seed-time, the ridges are cloven down, after which the land is ploughed across; and, when sufficiently dry, is rolled and harrowed repeatedly, till all the roots of weeds are brought into view, gathered into heaps, and either burned on the field or carried to the dung-hill. It is afterwards ploughed, rolled, harrowed, and gathered as often as may be necessary, completely to pulverize it, and remove all the weeds. This perhaps exhibits rather a favourable view of the usual mode of fallowing in Britain; and, should it appear to surpass the diligence and labour of the Roman farmer, it must be remembered that the fallowing of the latter was only followed by a single crop, and the process repeated every second year; whereas, in Britain, upon the manner in which the fallowing operations are conducted, depend not only the ensuing crop, but, in a great measure, all the crops of a five or six years' rotation.

We shall resume the subject of Roman agriculture in a subsequent number, when we hope to furnish much interesting information respecting their other agricultural operations and the produce and profits of their husbandry.

ON THE ACCLIMATING OF PLANTS. By JOHN S. BUSHNAN,
Esq. Member of the Edinburgh Royal Medical and Plinian
Societies, &c.

Among the many natural agents affecting the growth and maturation of plants, heat and culture stand predominant. A certain degree of heat is indispensable to vegetation, though this degree varies with the constitution of every individual; observation has fully established this; and it appears that there is a principle, inherent in every plant, and peculiar to itself, which, while it renders a certain degree of heat necessary to its vegetation, enables it also to bear without injury a certain degree of cold. Even in plants growing side by side in their native soil, the extent of this principle, and the range between the two points, constantly differ: one plant will bear a degree of cold which would kill the other, and *vice versâ*. In the Royal Botanic Garden of Edinburgh, several trees from New Holland are growing in the open air; they were all obtained from the same neighbourhood, and are now placed, as regards each other, in nearly their original situations; yet all do not with equal facility bear the changes of our climate: a temperature of -18° of Fahrenheit does not affect the *Eucalyptus cordata*, while that of -6° kills the genus *Cassia*.

Culture acts upon plants, by bringing into action the natural agents necessary to vegetation, such as light, heat, soil, situation, &c. There is no cause so constantly and so powerfully operating in bringing plants to perfection, and there is none whose influence is so multiplied; and so considerable in increasing the number of plants in a country, by introducing new species into its fields and borders. It changes the very nature and habit of plants. Not only are the organs increased in beauty and in size, but by its agency are even altered: leaves become corollæ; corollæ, leaves. Plants, which in their natural situation are biennial, are by cultivation reduced to annuals, from the increased rapidity with which they are hurried on; in the performance of their several functions. The reverse of this position also holds true; for, if we produce a delay in the period at which annual plants flower, with many we succeed in converting them into biennials. Wheat will furnish us with a familiar example. In its natural state it is but an annual

plant, pushing from the seed in spring, flowering in summer, ripening its grain in autumn, and dying with the approach of winter,—the whole period of its existence scarcely exceeding six months. From the mode in which it is generally cultivated, however, its life is often protracted to twelve, sometimes to thirteen months, being frequently sown in September, and not reaped until the October of the following year. Numerous other individuals are improved in their natural qualities by cultivation. All the varieties of apple, for example, owe their origin to the sour and unpalatable Crab, which no one would now recognize in the flavour and beauty of our choice apples. Cultivation has multiplied the varieties of the Pear almost to infinity, and produced them all from one worthless species. The peach, in its wild state, in Media, is poisonous; but cultivated in the plains of Ispahan and Egypt, it becomes one of the most delicious of fruits. In few plants are the effects of cultivation more apparent than in the Brassica tribe. However extravagant it may appear, all the varieties of red and white cabbage, Savoy, Brussels sprouts, winter greens, cauliflowers and broccolis, have sprung from one poor and insignificant-looking weed,—the Brassica oleracea, common in many parts of the kingdom. The grape and the fig are not indigenous to France, but by cultivation have become naturalized there; in like manner, the orange to Italy, and the cherry to us. The narrow-leaved elm was brought from the Holy Land during the Crusades; buck-wheat, and most species of grain, came also from the East, and, along with them, several plants found among corn alone. Bruce says he found the oat wild in Abyssinia; wheat and millet have been found wild on the hills in the East Indies. To the influence of culture, in varying and improving the natural qualities of vegetables, do we owe many of the luxuries of the table and dessert; nay, man could scarcely have been civilized but for this power of culture over the vegetable kingdom. The present state of society depends for its existence on the production of grain; but grain in its natural state is not worth cultivating. Wheat, before it has been subjected to the influence of cultivation, is an insignificant and worthless seed; yet to this same seed, when improved by culture, and to others as trifling, when subjected to the same process, do we owe all the comforts of civilized life. Culture has on the brute

creation analogous effects; the colour, shape, size, flavour, and very habits of plants, are altered by cultivation, and precisely the same effects are produced upon animals. Man himself varies in colour, size and habit, according to the circumstances in which he is placed; indeed, it seems a law throughout the whole animate creation, that each individual shall become habituated to such circumstances. But the most extraordinary power of cultivation, and one to which we owe most of our flowers and fruits, is the change it produces on the natural habits of plants; delicate exotics may be made to grow in the open air in this country; vegetables truly aquatic may be made to grow in dry ground, and plants may be habituated to circumstances of a very different description from those to which they were accustomed in a state of nature. Much difference of opinion has existed as to the truth of this assertion: but, be that as it may, it is our duty to endeavour to find out by every means within our power what plants will, and what will not, bear our climate; as, by such endeavours alone can we hope to increase our vegetable productions, and thereby add to our agricultural wealth. Much has been done, but much remains to be done; for there can be no doubt, and every day's experience still farther tends to confirm the fact, that many productions of foreign climes may advantageously be introduced into this country. Cultivation is daily improving the climate; and it is by no means Utopian to suppose, that in time we shall be possessed of many of the choicest productions of tropical climates.

No example can better demonstrate the extraordinary power of Nature in overcoming, by culture, the peculiar habits of individuals of the vegetable kingdom, and habituating them to the circumstances in which they are placed, than the Siberian crab. This tree, when first introduced into this country from Siberia, put forth its leaves and flowers at the first indication of the approach of spring. While other trees yet wore the garb of winter, this was gaily decked in all the beauties of May. In its native country, the interval between winter and summer is but short; there is scarcely any spring, and that at once bursts forth into a glorious summer. There, it had not been accustomed to the second winter so common with us, or to the sudden checks vegetation so frequently receives during our deceitful spring, and it broke from a state of torpor and inactivity

with the earliest retreat of winter. The consequences were such as might have been anticipated,—with the first frost it received a check—its shoots, unable to withstand the shock, perished. But now view this tree, so ornamental to our gardens and our shrubberies; it has become accustomed to our climate; it does not so hastily put confidence in our treacherous spring; and, advancing more cautiously, escapes destruction.

Another very extraordinary example is mentioned in Leslie's Agricultural Survey of Moray and Nairn. Two sorts of barley are cultivated in that district—barley, with two rows of grain in the ear, and *Scotch bear*, which, with a shorter ear, has six rows, generally double the number of grains, but smaller, and ripening earlier in colder seasons and more exposed situations. Now, according to this authority, if the purest and most unmixed barley be sown in the upland districts of Morayshire, it will, in the course of a few seasons, be changed into pure and unmixed bear. We suspect, however, there has been some error in the observer; for barley and bear are distinct *species* of plants.

Sir Joseph Banks thought that many plants, and probably the greater number, might, by art, become inured to a climate, soil, and situation, foreign to their original habits; and certainly many circumstances, received as truths by the generality of horticulturists and vegetable physiologists, seem to warrant our acceptance of his theory.

“ In the year 1791,” says Sir Joseph, in the first volume of the Transactions of the London Horticultural Society, “ some seeds of the *Zizania aquatica* (Canadian rice), were procured from Canada, and sown in a pond at Spring-grove, near Hounslow; they grew and produced strong plants which ripened their seeds. These seeds vegetated in the succeeding spring; but the plants they produced were weak, slender, not half so tall as those of the first generation, and grew in the shallowest water only; the seeds of these plants produced others the next year, sensibly stronger than their parents of the second year. In this manner the plants proceeded, springing up every year from the seeds of the preceding one, every year becoming visibly stronger and larger, and rising from deeper parts of the pond, till the last year, 1804, when several of the plants were six feet in height, and the whole pond was in every part covered with them as thick as wheat grows on a well managed soil.”

" Here," adds Sir Joseph, " we have an experiment which proves, that an annual plant, scarce able to endure the ungenial summer of England, has become, in fourteen generations, as strong and as vigorous as our indigenous plants, and as perfect, in all its parts, as in its native climate." Not only has the *Zizania* been acclimated in Middlesex, but also in Ross-shire. It grows on the margins of ponds, and is very prolific of bland farinaceous seeds, which afford a very good meal. It abounds in all the shallow streams of North America, where its seeds essentially contribute to the support of the wandering tribes of Indians, and feed immense flocks of wild swans, geese, and other water-fowl. Pinkerton remarks, that this plant seems intended by nature to become the bread corn of the north.

The laurel was introduced early in the seventeenth century, by one Cole, a merchant, residing at Hampstead, who tells us that he used to cast a blanket over it to protect it in frosty weather. This shrub has not yet become entirely acclimated, as it often suffers considerably in severe frosts; yet it is a well known fact, that plants raised from cuttings of such as have grown in this country, are more hardy, and thrive better, than those produced from seeds which had been imported from the warmer climate of which the laurel is a native.

Potatoes were introduced about the middle of the sixteenth century, and it appears from the details collected on the subject, that they were first brought into Europe from the mountainous parts of South America. Potatoes have not been grown in gardens in Britain more than one hundred and seventy years; nor, to any extent, in the field, above seventy-five. During this time, they have been cultivated with the greatest care; but it is not many years since they became naturalized sufficiently to ripen their seeds; and, even now, after a cold and frosty night, we often find whole fields of potatoes become nearly black, excepting in situations where they are protected by a hedge or trees from the inclemency of the weather. In the Highlands of Scotland, this is particularly the case. Frost frequently occurs early in September, and the crop, in consequence, is often prematurely destroyed. It becomes, therefore, of the greatest importance that the seeds should repeatedly be sown, not only, as is generally the case, to obtain new varieties, but to endeavour to produce a plant more hardy, and capable of withstanding, at least, the first frosts of winter.

Oranges and lemons, trained as peach-trees against the wall, are not uncommon in the south of Devonshire. Their fruit is often as fine and as large as any from Portugal. Mr Bastard, who had the greatest number of these trees, remarked, that stocks raised from seeds in his own garden, bore the cold better than those imported from abroad *.

Dahlias were first introduced into Spain from Mexico, in 1787. In the year 1802, three specimens reached Paris, an account of which was published by Monsieur Thouin, in the "Annales du Museum d'Histoire Naturelle." They were first cultivated in the hot-house, and propagated by seedlings, some of which being removed to the open air, were destroyed in one night by a slight frost. Thouin, however, did not despair of being able to change, in time, their habits, and acclimate them in France. In support of his opinion, he instances two plants from the same country, the marvel, and long-flowered marvel of Peru, which, though very tender and delicate, when first introduced, had become more hardy, especially the former, which often sprung up in the parterres from self-sown seeds.

The *Canna Indica*, a native of very warm climates, has become so perfectly habituated to Guernsey, that it scatters its seeds every year, and soon proves a troublesome weed in every garden where it obtains admittance. It is said, that, when raised from these seeds, it readily flowers in the open border in this country.

When mignonette was first introduced from Africa, in 1752, it was cultivated in the house; it now ripens its seed in the open air, and has become perfectly naturalized.

The splendid annual, *Coreopsis tinctoria*, a native of the West Indies, has now become so hardy, that it stands the winter in almost all situations; seeds, self-sown, arrive at the greatest perfection.

In the remarkably fine summer of 1826, a seedling cucurbitaceous plant accidentally appeared in the asparagus quarter at the garden of the Priory, the seat of Lady Mary Lindsay Crawford, near Cupar-Fife. Mr James Dick, the intelligent gardener, protected and encouraged the plant, being anxious to ascertain its species. It soon flowered and set fruit; and the summer continuing bright and warm, the fruit swelled, and acquired a considerable degree of maturity. Instead of being a

* Philosophical Transactions.

gourd, as was at first suspected, it proved a melon, possessed of flavour equal to that of the common canteloup, from which it had evidently sprung. In the autumn of 1826, Mr Dick sent specimens of the fruit to the Horticultural Society; and Mr Neill, the Secretary, requested him to sow some of the seeds yearly, and to watch the progress of successive generations, either in the open ground or in cold frames, with the view of observing whether a somewhat hardier character might not thus be acquired. Mr Dick has done so, with sedulous attention; and this autumn, 1829, ripe and well flavoured specimens were submitted to the Society, which had come to maturity in a cold frame, notwithstanding the very unpropitious weather which prevailed during the whole of August and September. Mr Dick is, therefore, of opinion that this seedling melon, raised entirely in the open air, and which ripens in a cold frame even in a bad season, may be accounted a "half-hardy" variety.

It would certainly be a matter of moment, nay, one of the greatest importance, to discover that, although the original plant first imported to a colder climate is unable to resist its severity, yet its seeds produce hardier plants, and these again still more so, till individuals are obtained perfectly naturalized and acclimated; but, reserving for a future opportunity the consideration of this theory; and, for the present, laying it altogether aside, it is very certain that numerous plants that were formerly cultivated in the hot-house and conservatory, are now found to be capable of withstanding our severest frosts, thriving and bearing fruit in the open air: and, "thus we see," says Dr MacCulloch, "every where flourishing in the borders, the most luxuriant plants of *heliotrope*, *fuchsia*, *verbena triphylla*, *geraniums*, and numerous others, replacing the wretched starved specimens formerly nursed with the greatest anxiety in the green-houses." Whether this is owing to their having gradually become capable of bearing our climate, or that they were, from their first introduction into the country, able to do so, is still a matter of opinion, of doubt, and uncertainty. Much may be said, and many facts produced, on both sides of the question, the examination of which we shall take an early opportunity of entering upon. Horticulturists are too apt to judge of the hardiness of plants, and their capability of bearing the severity of our climate, from the nature of that from whence they come, and thus, seldom

thinking of giving them a trial, many individuals that no one would have planted, but in a very high temperature, have accidentally been discovered to be perfectly able to flourish in the open air; and because others, on being removed from the house, have perished, it was immediately supposed they could not vegetate but in a warmer atmosphere. Even the common roses that are kept in our dining and drawing rooms, being thus rendered more susceptible of cold, often perish on their sudden exposure to it; whereas, had they been gradually habituated to its impression, they would, without injury, have borne it. Phenomena analogous to these, are daily observed in the animal kingdom, and we therefore should not be discouraged, nor relinquish our attempts, should we fail in our early endeavours to acclimate plants.

It has been recommended that the plants to be tried should be put out in the beginning of summer, turned out of the pots into poor and very dry soil, and sheltered from the east and north winds. From the hot-house, they should be removed to the green-house, then to the open frame, and finally to the border,—covered up the first winter, and even the second, should it not prove mild.

In general, plants bear to be removed from cold to heat better than from heat to cold; hence, a greater proportion of the natives of this country thrive in the south of Europe, than can bear transportation from thence to us. This facility of emigration is by no means universal; nor in every case, where it is practicable, is it accomplished without difficulty and inconvenience. There are many plants that will not bear a warmer climate: thus wheat and barley will not grow within the Tropics, while, with numerous individuals, the contrary is the case, they will bear a removal to a colder climate, where the frosts of winter are often accompanied with snow, which shelters the plant from the inclemency of the atmosphere until the return of spring; and thus many trees and plants may be acclimated by planting them among natural coppice, where they are, in a great measure, protected from the weather. Every one, on entering a wood in winter, must have been struck with the difference of the temperature from that of the open field, as well as seeing there several plants, such as the cowslip, violet and snowdrop, in full flower; while, in the neighbouring gardens, their leaves have scarce made their appearance. It is well known that many rare plants,

which had disappeared with the cutting down of a wood, have reappeared when it has again grown up. "One reason why the American plants grow so luxuriantly at Fonthill Abbey," says a writer in the *Gardener's Magazine*, "is, that they were introduced among native underwood, interspersed among bushes of hazel, dogwood, &c., and sheltered by firs, oaks, and other timber trees." A shrubbery is, therefore, to be considered as the best place for acclimating exotics, whether trees or herbs, and more especially if the soil be dry, and the shrubs chiefly deciduous; for it should not be forgotten, that many believe that a coppice wood of evergreens is always colder than one of deciduous bushes, owing to the leaves presenting a greater surface for evaporation. Groves of evergreen trees, on the other hand, especially of the pine and fir tribe, present a warmer climate beneath them than groves of deciduous trees; because the former, from the closer texture of their exterior surface, reflect back more completely the heat radiated from the ground below. The more any plant is shaded in winter, the less danger it will be in of suffering from frost. For, when a plant or water is so situated as to be overtopped by trees, the radiation of caloric is in a great measure checked; and thus, in such situations, we may often observe water unfrozen, and plants unhurt by the cold, and many retaining their leaves, when others, of the same species, at a short distance, but unshaded, lose their leaves and suffer considerably.

Mr John Street, the gardener at Beil, who has succeeded in acclimating numerous plants, states, in the *Transactions of the London Horticultural Society*, that he has found poor, dry and shallow soils, and declivities, to be best adapted for preserving plants through the winter season. The quicker the superabundant fluid passes away from the roots the better. From every observation, it appears, that those plants which have the least sap in winter, or whose sap is of a resinous or oily nature, suffer least from cold. It would be foreign to our purpose to enter into a discussion of the cause of this, or of the theories that have been built upon it; suffice it at present to say, that it has been supposed that the principal cause of the destruction of tender plants, in winter, is owing to the vessels being burst by the freezing of the sap. In choosing plants, therefore, for our experiments, we should attend to their organization: annuals bear

exposure better than perennials ; and those abounding in sap, having a spongy porous wood, and much pith, succeed with difficulty. It seems advantageous that those plants to be tried should be deprived of moisture as much as possible. Mr Street found, that, when planted above drains, several reputed greenhouse species have flourished most luxuriantly. Plants do not suffer from frost in dry situations, nearly so much as they do in moist, or when an excess of rain is followed by a severe frost. The reason is evident,—in moist situations, part only of the moisture is evaporated during the day, the rest remaining to be converted into ice by the cold of the ensuing night. This icy covering increases the cold, till the vital principle, and resistance given by the formation of the bark to the entrance of cold, are overcome ; the sap is frozen, and the vessels burst by the expansive force of freezing.

Plants, in a warm climate, perspire more than in a cold one ; so that in the one they require much, and in the other little moisture. The inhabitants of a hot-house must be abundantly supplied with water, to replace the constant evaporation that is going on ; but, on being transplanted to a colder climate, they should have a drier soil ; and, when from a colder to a warmer, a moister one, than in their native station.

It has hitherto been regarded, almost as an axiom, that no plant produced by cuttings ever becomes hardier than the parent tree, through whatever succession of progeny thus formed. Dr M'Culloch doubts the truth of this assertion, and Mr Street has found that “ plants obtained from cuttings are hardier than seedlings, the roots of the former seem to possess more ability to resist severe weather ;”—his experience is very considerable, and his opinions merit our attention. Mr Street always plants cuttings, if they are well rooted, in preference to seedlings. The vine is almost always propagated by cuttings, and but few will assert that grapes are not more frequently ripened in the open air now than formerly.

Numerous productions of other climes are now cultivated in our open fields, and may in time be applied to useful and profitable purposes. The *Phormium tenax*, or New Zealand hemp, now employed for producing the strongest cordage used in the navy, particularly on the New Holland station, has long grown in the open air in the counties of Waterford, Cork, Limerick, Louth, Wicklow and Dublin. During a period of thirty years,

it has only suffered once or twice in the extremities of the leaves, from the most severe frosts. Six leaves give an ounce of dried fibres, which it is calculated will exceed per acre the produce of either flax or hemp. It may be observed, however, that the separation of these fibres from the matter of the leaf is not at present well understood. Whether this plant may ever become an object of cultivation with us is very doubtful. Two plants, however, have succeeded well near Inverness; they require no shelter, growing in a very exposed situation. The specimens in the Royal Botanic Garden of Edinburgh are very vigorous, but have not flowered.

The *Tetragonia expansa*, or New Zealand spinach, was introduced from New Zealand by Sir Joseph Banks, in 1772, and treated as a greenhouse plant, but has lately been found to grow as freely as the kidney-bean, or nasturtium. As a summer spinach, it is as valuable as the orache, or even more so. Every gardener knows the trouble that attends the frequent sowing of the common spinach, throughout the warm season of the year; without that trouble it is impossible to have it good, and, with the utmost care, it cannot always be obtained exactly as it is wished, from the rapidity with which the young plants run to seed. The New Zealand spinach, if watered, or raised on a rich soil, grows freely, and produces leaves of the greatest succulency during the hottest weather. Anderson, one of its early cultivators, had only nine plants, from which he says, "I have been enabled to send in a gathering for the kitchen every other day since the middle of June, so that I consider a bed, with about twenty plants, quite sufficient to give a daily supply, if required, for a large table."

Near Exmouth, this invaluable addition to our kitchen gardens has become quite a weed: wherever it has once grown, plants rise spontaneously.

The *Zea mays*, or Indian corn, is making great progress in this country. It seems that the crop may be raised to advantage in the field, on some light soils, particularly the poor sands of Norfolk and Suffolk, or on any hot burning lands: in the countries where it is indigenous, it grows on light hot soils. As bread-corn, it is far inferior to wheat, but it yields an excellent provender for horses, sheep, cattle, hogs, &c. A gentleman near Dalkeith has this year sown two acres of land with it.

Tobacco has become perfectly naturalized in this country, ripening and sowing its seed yearly in many gardens; and, were it not for its prohibition by law, this plant would become an object of cultivation and immense profit to the agriculturist.

The Arracacha has been introduced from Bogotá; but stands our winter with difficulty. This plant is one of the most useful vegetables in South America. The roots grow to the size, and nearly the shape, of a cow's horn. They yield a food which is prepared in the same manner as potatoes, is grateful to the palate, and so easy of digestion, that it frequently constitutes the chief aliment of the sick. Starch and pastry are made from its fecula, and the root, reduced to pulp, enters into a composition of certain fermented liquors, supposed to be efficacious as tonics. In the city of Santa Fé, it is universally used as the potato with us. The cultivation of this plant requires a deep black mould, which will easily yield to the descent of the large vertical roots. The mode of propagating it, is to cut the root into pieces, each having an eye or shoot, and to plant one of these in each hole. After three or four months the roots are of a sufficient size to be used for culinary purposes; and, if allowed to remain six months in the ground, they become considerably larger, without any detriment to their taste. Like the potato, this vegetable does not thrive in the hotter regions of South America, for there the roots acquire scarcely any size, but throw up a great number of stems. The Arracacha thrives in the more temperate regions, but never so well as in the mountainous districts, where the medium heat is between 58° and 60° of Fahrenheit. There it is that these roots grow most luxuriantly, and acquire the most delicious taste.

It is well known that, during the latter years of the late war, in consequence of the French colonies having been captured by Great Britain, sugar was manufactured in considerable quantities in France, from beet-root; indeed, nearly the whole consumption was obtained from this source. During the war the manufactories flourished, but as soon as the peace of 1816 took place, and caused the sudden introduction of West Indian sugar through Holland, they were ruined by the comparatively low price at which the foreign sugars were introduced, in consequence of the necessity which the government felt of relaxing its rigorous decrees against foreign commerce. As, however, the price of foreign sugar rose again after the peace of Europe

was established, several of the old beet-root sugar manufactories of France were re-opened, and profitably worked, as the supply of the French colonies was not adequate to the increasing consumption; and the duty upon the foreign growth being about $3\frac{1}{4}$ d. per pound, whilst the sugar made in the French colonies was also charged with a duty of about $1\frac{1}{2}$ d. per pound. The manufactories are daily increasing, and it seems probable that the consumption of sugar on the Continent will be soon entirely confined to that obtained from beet-root. One manufactory at Arras furnished, in 1827, one hundred thousand kilogrammes of this article; and beet-root sugar seems likely soon to exercise some influence over the commerce of Europe. The consumption of sugar in France is estimated at about eighty millions of kilogrammes annually; and, if the home manufactory continues to receive as much encouragement as it has hitherto done, France will shortly grow upon her own soil most of the sugar she consumes*. In this country, the beet-root may be procured as cheap as in France; and as the cost of fuel for the manufacture would be much less, it would seem to be a profitable article of cultivation to the agriculturist, particularly as the sugar imported from the British West Indian colonies pays a duty of nearly 3d. per pound. After the juice has been extracted, the pulp is used for feeding cattle, for which it makes a good winter food. On the Continent, the farmers mix a small quantity of flax seed-cake with the root, to make it more nourishing.

Our limits do not permit us to bring forward more examples of plants that may be turned to a good account in this country, both to the manufacturer and the agriculturist. The practical advantages to be obtained by the introduction of foreign species are considerable, and will amply repay him who will devote some part of his time and attention to the discovery of those foreign plants that are, and are not, capable of bearing our climate. To increase the variety and beauty of our shrubberies is no inconsiderable object; and it must be with satisfaction and pleasure that we contemplate and compare those of the present day with others of the last century, which, while they point out how much has been done by care and perseverance, should encourage us to go on, and endeavour to add to the vegetable productions of our country.

* See Article on Beet-root Sugar in No. V. of this Journal.

ESSAYS ON THE ORIGIN AND NATURAL HISTORY OF DOMESTIC ANIMALS. By JAMES WILSON, Esq. F. R. S. E. M. W. S. &c.

ESSAY II.

ON THE ORIGIN AND NATURAL HISTORY OF THE HORSE,
AND ITS ALLIED SPECIES.

IN the following brief notices, I do not propose to enter into any detailed account of those numerous and diversified breeds of the domestic horse which have resulted from the skill and perseverance of the human race,—knowing both my own incompetence to such a task, and the many able and experienced contributors by whom such branches of rural economy are likely to be illustrated in this Journal. I shall rather confine myself for the present to a statement of what is known or believed by naturalists regarding the origin and primitive condition of this inestimable animal, and its kindred species.

The Genus *Equus*, according to the views of modern naturalists, contains six different, though nearly allied, animals, viz. *Equus Caballus*, the Horse; *E. Hemionus*, the Dziggethai; *E. Asinus*, the Ass; *E. Quagga*, the Quagga; *E. Zebra*, the Zebra, or mountain Zebra; and *E. Burchellii*, the Zebra of the Plains. The characters which distinguish these animals from each other, though sufficient for the purposes of the naturalist, are not anatomically considered, of an essential or important nature. They are, for the most part, superficial, and consist in the comparative size of the ears, the length and texture of the hair, and the distribution of the external colours. The size can scarcely be assumed as a specific character, because it varies remarkably in the same species. Hence the most skilful comparative anatomist can with difficulty distinguish a species of this genus merely from the inspection of a few isolated bones, although such inspection is amply sufficient for the determination of species in the case of almost every other animal of which we possess an osteological knowledge. The same observation applies to the bones of fossil horses, which present no precise character

by which to distinguish them from the medium sized existing species. Osteologists are, therefore, unable to determine with precision whether the bones of fossil horses, commonly so called, pertain to an extinct or modern species; although a pretty conclusive argument in favour of the former theory is, perhaps, derivable from the fact, that, geologically considered, the fossil horse occurs in beds or strata possessing the remains of other animals, the living analogies of which are entirely unknown.

I shall first consider the geographical distribution of the above named animals; and the most obvious fact in this view of the subject appears to be, that none of them occurs *naturally* either in Europe or America. The native country both of the horse and ass, is considered to be those desert lands which environ Lake Aral and the Caspian Sea. The former species inhabits (in the wild state) as far north as the 56th degree; the latter never voluntarily passes beyond the 45th degree; but in its southern migrations it descends to the Persian Gulf, and even to the southern extremity of Hindostan. It was seen by Odoar Barboza among the mountains of Golconda, and those troops of wild horses mentioned by Turner as frequenting the upland countries of Bouton, where they are called Gourkhaws, were in fact onagers or wild asses.

The *Equus Hemionus*, or Dziggithai of Pallas, is confined within more eastern districts, at least there is no proof of its existence to the west of Lake Aral, and the mountains of Belur. Its continued restriction to the eastern parts of Asia is a remarkable example of that predilection manifested by many wild animals for the soil which gave them birth, and which probably results from the circumstance of their finding nowhere else, in such abundance, the plants which constitute their favourite food. It is thus that the sister sciences of Botany and Zoology become connected with, and mutually illustrate, each other.

It seems a matter of doubt whether wild horses ever existed in Africa. A certain passage in Leo Africanus (Elzev. Ed. p. 752.), which has been quoted in proof of this, probably relates to the wild ass; and, even if it were otherwise, no conclusion could be drawn from it concerning the distribution of ani-

mals, because it is supposed by some that an Asiatic rather than an African district was really the subject of description. If either the one or the other of these animals existed in that country in a wild state, their gregarious habits would have afforded such proof as speedily to set the matter at rest. Eye-witnesses have assured Pallas of their having frequently observed, in the deserts of Tartary and of Persia, the route of congregated wild asses, forming a path of 300 toises (above 600 yards) broad. It has been further observed, that as in their annual migrations towards the Equator, these animals follow, at a considerable elevation, the course of the great mountain chains, it is not probable that they have ever descended into Africa; where, moreover, the great antiquity of population and early culture of Egypt would have presented almost insuperable barriers.

At the other extremity of Africa, south of the Equator, we meet with those remarkable species of the horse tribe—the zebra and the quagga, at one time regarded as varieties of the same animal, because they were occasionally seen to pasture in company, but now ascertained to be quite distinct. The immense distance, and the many insurmountable obstacles which separate these two species from the Dzigghithai of Asia, is a proof, if such were required, of the separate origin of the latter; while the existence of two species, so nearly allied as the zebra and the quagga, within the same geographical limits, and subject to daily *rencontres*, without any third or intermediate variety having been produced, may be regarded as a proof that, in a state of freedom, wild animals of distinct kinds have no sexual intercourse with each other. The entire similarity, or rather identity, of climatic influences under which these two species co-exist, also points out that neither is derived by alteration from the other, but that each has descended from a separate type, and forms a primitive species. The *Equus Burchellii* is likewise an inhabitant of Southern Africa. Its discovery resulted from the observations of Burchell, who, however, appears in the first place to have confounded it with the common zebra, which latter animal he describes in his African travels as the new species. In regard to the three northern species of the genus,—the horse, the ass, and the dzigghithai, although they all draw their origin from countries not widely distant

from each other, yet a considerable difference in their distribution may still be observed. The localities of the dziggithai, for example, are prolonged under meridians where the wild ass never occurs, while the latter proceeds much further to the south, in the course of its periodical migration than the horse, which last named animal advances alone almost to the Polar Circle.

The six species which compose the genus *Equus* resemble each other as much in their nature and habits, as in their physical structure. They all live assembled in troops, more or less numerous, and are remarkable for what may be termed a natural system of military tactics. According to Azzara, those magnificent troops of *insurgent* horses (*Alxados*) which have become wild in the plains of America, to the south of the Rio de la Plata, sometimes amount to 10,000 individuals. Preceded by videttes and detached skirmishers, they advance in a close column, which nothing can interrupt or break. If a travelling caravan or a body of cavalry is perceived approaching, the leaders of the wild horses advance upon a reconnoissance, and then, according to the movements of the chief, the whole body passes at a gallop, to the right or left of the caravan, inviting at the same time by a deep and prolonged neighing, the domestic horses to desertion. These often join the "rebel host," and are never again observed voluntarily to submit themselves to the domestic state. These wild troops often return again with a threatening aspect, sweeping around the caravan, or hovering near it like a cloud. At other times they describe a single bold circle, and after uttering a cry of defiance, they disappear over the wilderness. Each of these great squadrons is composed of a reunion of smaller companies, separately formed of as many mares as a single horse is able to keep under subjection. These animals, descended from the ancient breed of Andalusia, are however inferior to their ancestors in beauty, strength, and celerity of movements. Their heads are thicker, their limbs coarser, and less symmetrical, their necks and ears longer; and, in all these qualities, it has been remarked, they approach again to the primitive model of the species which still exists in a wild state in the deserts of Tartary. Domestication, therefore, is not, as Buffon has maintained, always prejudicial to the nature of animals; for an approach to the *beau ideal* or

perfect model of a horse, is probably to be found not among the desert tribes, as the French Pliny supposes, but rather in some one of the cultivated races of Spanish or Arabian birth.

Among the wild horses of South America, the usual colours are chesnut bay, *zain*, and black. Individuals of a black colour are, however, so extremely rare, that there is scarcely one out of two thousand observed of that colour. There are usually about ninety chesnut bays to ten *zain*. From this great preponderance of the chesnut, Azzara concludes that horses which have become wild recover after a lapse of time, and as a consequence of liberty, the manners, inclinations, form and colour, of their primitive types. According to Foster, there are neither pied nor black horses among the wild troops of central Asia, among which the dun and greyish-brown prevail, and may therefore be regarded as the characteristic and original colours of the species.

When left free to the choice of a habitation, it has been observed that these animals always fix upon situations very analogous to those occupied by the native and unreclaimed species of Asia. The Savannas of New Mexico, the Pampas of Buenos Ayres and of Patagonia, and the Karoos of Southern Africa, all bear a general resemblance in the uniformity of their level, and the style of their vegetation, to the Steppes of Asia. Even the climate of the countries where the domestic breeds are cultivated to the highest perfection, with the least trouble, may be said to indicate the nature of the country where we may expect to find the indigenous stock. The horses of Arabia, of Persia, and of Barbary, where the heavens are almost perpetually serene, the atmosphere very dry, and the soil light, and for the most part sandy, are the most beautiful, and in every way the most perfect, of their kind; while, in Europe, the Spanish breed, which enjoy a climate less different from that of the East than most European countries, are *naturally* the finest on our Continent. Many varieties of English origin are no doubt most remarkable for strength, beauty, swiftness, and every other attribute of a perfect horse; but this is rather to be attributed to the wealth, perseverance, and peculiar fancies of the English nation, than to any natural advantages of climate. In Sweden, also, notwithstanding the cold and moisture, the

prevailing breed, or that which is characteristic of the country, though small, is finely limbed, and remarkably sure footed—properties which may, in a great measure, be attributed to the numerous precautions made use of to defend them from humidity, even in the stable. By this means they are preserved from those defluxions which so frequently attack them in moist climates.

The multiplied variety of colour in the domestic races of the horse, when compared with the uniform aspect of the ass, equally reduced to servitude, has induced some to suppose that the latter has not been so long nor so generally under the dominion of man. In the time of Aristotle, the ass was not found in Thrace, nor even in Gaul; but, on the other hand, we know from the sacred writings, that it was used as a beast of burden in the remotest ages of the Jewish history, and was, therefore, in all probability, reduced to servitude by the eastern nations fully more early than any other animal not immediately necessary to the existence of a pastoral people. Its comparatively recent reduction then, cannot, as Buffon has alleged, be assigned as the cause of its greater uniformity of colour. This must rather be sought for in the different natures of the two animals, when acted upon by the influence of climate, leading the one to vary only in form and stature, and the other in colour as well as form. In other respects, the causes of degradation to which the ass is subjected, are even more violent than those which affect the horse; its life is equally or more painfully laborious, and, from its less value, it is more neglected during its hours of repose. The countries to which it is a native are also, as I have said, more restricted in a northern direction; and the influence of cold on its form and constitution may hence be inferred to be more direct and powerful. The domestic races of our northern climes being rarely, if ever, improved by crosses from a purer race, the deterioration of the animal is not a matter of wonder. Under the warm and serene climates of Asia, on the contrary, where the breed is not only carefully tended, but frequently improved by intercourse with the fierce and fiery onager, the ass is an animal of great strength and considerable beauty. It is highly prized by the Persians, and several other nations, and

frequently equals in its capacity of enduring fatigue, and the celerity of its movements, the fleetest of the Tartarian horses.

The senses of hearing and of smell are very acute both in the horse and ass. It has been mentioned to me by those who were eye-witnesses to the fact, that it is much easier to approach a troop of wild horses from the leeward side than from the opposite direction; and that these animals, in travelling to a distant pasture, always run against the wind, by which means they are more speedily apprized of whatever danger may await them in their intended course. The same observation, I believe, also applies to the Bison of America, which, while journeying down the wind, frequently approaches unawares within gun-shot, but instantly takes the alarm at a much greater distance, should the huntsman interpose himself between it and a windward station. Both the horse and ass are alleged to become, in some manner, aware of the existence of water from a great distance, and are made use of by the Arabians and Tartars, as well as by the Spanish Americans in the Llanos of the Caraccas, during the season of dry weather, to discover the lagunes and desert springs.

I shall now give a short descriptive sketch of the six species which compose this genus.

Species 1.—THE HORSE.

(*Equus Caballus*, LIN.—*Le Cheval*, BUFFON.)

In the general observations by which I have just introduced this genus to the notice of the reader, will be found most of the scanty materials which illustrate the *natural* history, properly so called, of this particular species. Our domestic breeds are so numerous, and admit of such infinite variety, that a volume would scarcely suffice to contain their detailed records. The history of a wild animal is, in truth, confined to a few facts drawn from the observance of simple nature; but the history of a domesticated one is mingled with all the artful devices used to tame and subdue its native wildness—to modify or change its natural state; and not knowing how far example, constraint, or custom, may influence animals, and change their original habits and instinctive inclinations, the object of the naturalist ought to be to distinguish those facts which depend on instinct, and are therefore natural to an animal, from those which result

artificially from its altered mode of education,—to ascertain what really appertains to it as a natural inheritance, as well as what it may have derived through the intervention of man—and never, as Buffon has observed, to confound “the animal with the slave, the beast of burden with the creature of God.”

Before proceeding with our necessarily brief enumeration of the principal varieties of the domestic breed, I shall mention a few of those characters which are supposed to distinguish the horse in a state of nature. The head is large in proportion to the body, the front, above the eyes, bulging or convex; the forehead strait; the ears are long, and carried habitually low, and pointing backwards, after the manner observable in a vicious horse when about to bite, but their extreme points are slightly curved forwards; the circumference of the mouth and nostrils is garnished with long hairs; the mane is very thick, and prolonged beyond the withers; the back less vaulted than in the domestic varieties; the legs proportionally longer and thicker; the hair, sometimes long and waving, is never smooth; the colour is usually dun or brown; sometimes varying to a kind of cream colour, but never black or pied. These are the characters of the *Tarpan*, or wild horse of the Tartarian deserts.

Similar characters have been in part reproduced in the Andalusian race, become wild in the New World to the south of Buenos Ayres. Its size has decreased, its limbs have become thicker, its neck and ears longer, and the multiplicity of its colours has disappeared. Its hair has scarcely increased in length; but this is probably connected with the greater mildness and equality of temperature which prevail in its adopted country, than in the climate of the north of Asia. One remarkable distinction, however, exists between the *dispositions* of the South American and Asiatic wild horses, which is this,—that, at whatever age the former are caught, they are capable of being rendered serviceable to man almost in the course of a few days, whereas the latter can only be tamed when taken very young; and, even then, they frequently show themselves, in after life, to have been but half subdued. This would, of itself, be sufficient to prove that the one is the genuine original, the other merely a rebel or emancipated tribe.

In Asia, the congregated troops seldom exceed twenty indi-

viduals. In America, many thousands are sometimes seen together. In both worlds, a peculiar variety, with crisped or frizzled hair, has sprung up, but those of Asia are always white; whilst the American (frizzled) variety are of every colour, except white and pied. When we consider the almost constant relation which may be traced between the length and abundance of hair, and an increased degree of cold, we might have expected to discover this frizzled variety of America, rather towards the colder country of Patagonia, than in Paraguay, just as the corresponding variety of Asia is found under the varying climate of the Baskir nation*.

Although no doubt exists as to the occurrence of wild, or at least of what may be called independent or unreclaimed horses, in the countries which environ Lake Aral, in the southern parts of Siberia, in the great Mongolian deserts, and among the *Kalkas*, to the north-west of China; yet many thoughtful inquirers are of opinion, that these also, as well as the American troops before mentioned, are merely emancipated tribes, descended at some remote period from an enslaved stock, and that the real wild horse, using the term as we apply it to other animals existing in a state of nature, is extinct. We know, for example, that the wild horses (so called) mentioned by Pallas as pasturing in the deserts, on each side of the river Don, in the neighbourhood of the *Palus Mæotis*, are now believed to be the offspring of the Russian horses which were employed in the siege of Asoph, in the year 1697, and which, for want of forage, were turned loose to shift for themselves. The descendants of these have now assumed an aspect of great natural wildness.

In regard to our domestic races, the first place is due to the *Arabian*, as that which probably differs least from the native stock. It is, in general, less than the race-horse of this country,—very easy and graceful in its motions, though rather lean-

* A fine specimen of a white frizzled horse is preserved in the Paris Museum. It came alive to the French capital, in 1815, with the Cossack troops, of which it was one. I remember seeing, a few years ago, in and near Edinburgh, a good example of this variety, but of a brown colour. It was used as a cart horse. I did not ascertain the particulars of its history, or from whence it came.

er, in its general aspect, than we regard as consistent with perfect beauty. Having no other dwelling but a tent, the Arabian (of the human species), and his horse, live upon the most equal terms; his wife and family, his mare and her foal, generally lie indiscriminately together, whilst the children amuse themselves by caressing the animal, or climb about his body, without fear. The Arab never beats his horse, and seldom makes use of the spur: he rather encourages him by friendly and affectionate words; and we may guess the result: for even more savage brutes confess the influence of kindness, and its superiority in subduing the temper, and in softening the asperities of a rugged nature, over harshness and constraint*. The agility as well as the power of endurance of the Arabian horse is great; and, when his rider happens to fall (a rare event), he stops short in his most rapid career. It has been remarked, that instead of crossing the breed, as we are so frequently under the necessity of doing, the Arabs take every precaution to keep it pure and unmixed: they preserve, with the greatest care, and for an amazing length of time, the genealogies of their horses. Those of the first kind are called Nobles, being "of a pure and ancient race, purer than milk." Two other kinds, which have been degraded by common alliances, sell at lower prices. The following more detailed statement of these distinctions, is from Griffith's "*Animal Kingdom*," vol. iii. p. 448.

"The Arabs divide their horses into two races. One, in no great repute, and appropriated to servile uses, they name Ka-

* I find the following anecdote among my notes on this subject:—The whole fortune of a poor Arabian consisted only of a beautiful mare. The French Consul at Said, offered to purchase her for his master Lewis XIV, and offered a large sum of money, the temptation of which was so great that it overcame the scruples of the Arabian. The poor man, accordingly, soon after arrived at the Consulate, covered with rags, but mounted on his magnificent courser. As soon as he had dismounted, he was proffered the gold, which he eyed eagerly, but ever and anon turned with a deep sigh to his favourite mare. "To whom is it," he at last said sorrowfully, "that I am about to yield thee up? To Europeans! who will tie thee close, and confine thee in what thou wilt consider as a prison, though it may be a vaulted palace,—who will beat thee, and render thy life unhappy, and thy death miserable. Return with me, my jewel, queen of the desert, and again rejoice the hearts of my children." As he pronounced these words, he sprang upon her back, and vanished like an arrow.

dischi, which means *horses of an unknown race*. The second kind they call *Kochlani*, *Kohejle*, or *Kailhan*, which means *horses whose genealogy is known for two thousand years*. This race, say the Arabs, originated from the steeds of Solomon. The individuals composing it are sometimes sold at such enormous prices as appear almost incredible. They boast that these horses are capable of performing the most wonderful journeys, of sustaining the greatest fatigues, and of passing entire days without nutriment ; and of their impetuosity in attacking an enemy, and fidelity and attachment to their masters, many marvellous tales are related.

“ In the breeding of the *Kochlani* horses, the Arabs use the utmost precaution to avoid being deceived on the point of genealogy. The mares are covered in the presence of a witness, who remains near them twenty days, to make sure that they are not dishonoured by any vulgar stallion. The same witness must also be present at the accouchement ; and a certificate of the legitimate birth of the colt is made out within the seven first days subsequent to that event. Whenever all the prescribed formalities have not been rigorously performed, the colt is considered to be *Kadischi* ; and, whatever advantages he may possess, he is yet a serious loser, in consequence of the non-authentication of his birth. These precautions prove how amazingly jealous the Arabs are of preserving their better race of horses in the most untainted purity of descent.”

“ This race is principally cultivated by the Bedouin Arabs, between Bassora, Merdin, and Syria. They sell the stallions without any difficulty ; but, as we have already hinted, at a most enormous price ; but they will by no means consent to sell the mares ; and these last are never obtained by strangers, except fraudulently, or by dint of excessive bribery. These mares enjoy the exclusive privilege of transmitting the purity of the race to their descendants, and the genealogies are always reckoned from the mothers.

“ It is to be observed, that the mares of the *Kochlani* race are never covered by *Kadischi* stallions ; should that, however, take place accidentally, the colt is considered of the race of the father. It is frequent enough, however, to have the *Kadischi* mares covered by *Kochlani* stallions ; and, in this case, the colt is

considered of the race of the mother. All this proves what a high idea the Arabs entertain of the Kochlani race, and how utterly they exclude from it mixtures of all kinds."

To whatever object the wealth and ingenuity of the English nation may be directed, the result is usually successful. By unremitting attention to the breeding, and consummate skill in the training, the English *race-horse* is consequently one of the finest, and certainly the fleetest animal in the world. The famous Flying Childers was calculated to move at the rate of eighty-two feet in a second, or nearly a mile in a minute, but this, of course, only for a very short time. He also run round the Newmarket course, which is nearly four miles, in six minutes and forty seconds. Eclipse is supposed to be the fleetest horse that ever ran in England since the time of Childers. An ordinary racer goes at the rate of a mile in less than two minutes. In regard to the origin of this breed, it may be stated as proceeding from an Arabian or Barbary stallion and an English mare, already crossed with a Barb or Arab in the first degree, or the result of two crossings in the same degree. This is named first blood, being as near as possible to the foreign stock.

The English *Hunter* is a horse of great strength, spirit and activity. It is remarkable for what sportsmen call *bottom*, and is now widely spread over Britain, being frequently used, as soon as it has passed its prime, for more laborious and less spirit-stirring purposes than its noble nature merits. It is employed in posting, and for the conveyance of public vehicles, and is greatly esteemed on the Continent, where it brings higher prices than any of the native breeds. It is derived from the crossing of a stallion of the first blood, with a mare of a degree less near the original stock.

Another well-marked and very valuable variety, is the *Chaise and Carriage Horse*. This is larger, heavier, and more strongly limbed, and generally proceeds from a cross between the hunter and a more common mare. In common with the last named variety, it is frequently exported to foreign countries.

The *Dray Horse* probably results from a fine carriage horse, possessed of a certain portion of blood, and a very strong well-formed mare of the country breed. "The gigantic propor-

tions and immense powers of these horses are only equalled by their intelligence and docility. It may safely be said, that this breed of horses is not to be paralleled on the face of the earth.*” One of the most magnificent and truly English animals of which Great Britain can boast, is the great Lincolnshire *Black Horse*. Of this class the cavalry of England was formerly composed, but in active service their great size rendered them unwieldy, and others of a smaller but more active kind have been, with rare exceptions, substituted. It may be said that few objects more attract the wonder and admiration of a stranger who, for the first time, visits London from the remote provinces, than the gigantic draught horses of the capital. One of these powerful animals will draw, for a short distance, the enormous weight of three tons. The writers on rural economy do not seem to agree in their opinions regarding the origin of this variety, but the improved sub-variety is said to have taken its rise from some Zealand mares sent from the Hague by Lord Chesterfield. The improvers of this breed, such as Mr Bakewell of Dishley, and others, have frequently sold their stallions for 200 guineas, and have even let them out to hire at 100 guineas for a single season. The form of the Black Lincolnshire Horse has, by management, been materially altered and improved. “The long fore end,” Mr Bewick observes, “long back, and long thick hairy legs, have gradually contracted into a short thick carcass, a short, but upright fore-end, and short clean legs;” experience having proved, that strength and activity, rather than height and weight, are the more essential properties of farm horses.

A very useful animal for farm-work, and the excellence of which certainly consists more in its great hardiness than in the symmetry of its proportions, is called the *Suffolk Punch*. According to Mr Culley, the Suffolk and Norfolk farmers plough more land in a day than any other people in the island.

A small variety or species of this genus, very common in Wales and the Highlands and Islands of Scotland, would appear, for any thing we can say to the contrary, to be aboriginal inhabitants of these countries. Whether they ought to be regarded as a distinct species, or otherwise, it is difficult to deter-

* Griffith's Cuvier, vol. iii. p. 468.

mine with precision. Julius Cæsar himself bears testimony to the active and well disciplined spirit of the ancient British horses; but these must have been of considerable size to draw with activity the scythed chariots, which struck terror even into the war-hardened hearts of Roman legions. The *Equulei*, or *Shelties*, mentioned by Buchanan and Sir Robert Sibbald, as inhabiting the Orkney and Shetland Islands, and being about the size of asses (*asino haud majores*), are supposed by some to have been brought into Scotland from Scandinavia, when the Norwegians and Danes first obtained a footing in the northern parts of our kingdom. They certainly bear a strong resemblance to a breed still found in Norway, Iceland, and the Feroe Isles. One particular variety of the sheltie is sometimes light bay, dun, or cream-colour, but it has always a black line running along the ridge of the back, from the shoulder to the rump, a peculiarity which has also been observed to exist in many Norwegian horses, and in none else. They (the shelties) are, in fact, less than asses, and are remarkable for the nimbleness of their movements, and great surety of foot. Of those of Orkney, the author of "The Husbandrie used by the Orchadians," observes, "Their horses lieves on beare calfe, and grows exceeding fat on the same; they be very little, but quick and fierie:" to which Mr Mackaile adds, with seeming truth, "they all go barefoot, unless the gentlemen put shoes upon the horses upon which they ride themselves."

I shall conclude the first branch of the present inquiry by one or two general observations. In ancient times, the practices of chivalry in England, as elsewhere, must have rendered considerable attention necessary to preserve and improve the breed of strong, active, and docile horses. Even so long back as the reign of Athelstan, it may be presumed, from a law of that monarch prohibiting exportation, that English horses were in repute in foreign countries, although, at an after period, in consequence of a freer and more enlarged intercourse with other parts of Europe, we probably gained more than we had it in our power to bestow. The climate of Britain, is in fact too moist for the natural constitution of the horse; and it is only as a consequence of the excessive and unceasing pains which our wealth and industry have enabled us to bestow upon them,

that many of our modern breeds are so superëminent. *Roger de Bellême*, Earl of Shrewsbury, is among the earliest of the nobility noted for an attention to the culture and improvement of this noble animal. He is said to have introduced Spanish stallions into his estate in Powisland, in consequence of which that part of Wales was long famous for a swift and generous race of horses. The excellence of these is lauded by Michael Drayton (contemporary with Shakspeare), in the Sixth Book of his *Polyalbion*. Horsemanship in those times was of a higher order, and had nobler objects in view than in these degenerate days. War and gallantry, with their attendant virtues, courage and chivalric honour, were more ennobling in their effects than the zeal of the heroes of the great St Leger. Horse-racing was scarcely known till after the decline of chivalry, and appears to have been little practised in England till the time of James I., though, even in its early stages, it seems to have been not undistinguished by some of those characteristics which the ingenuity of its followers in later times have, no doubt, carried to much higher perfection. The gallant and philosophical Lord Herbert of Cherbury, while specifying the sports which he regarded as unworthy of a man of honour, observes as follows: "The exercise I do not approve of, is running of horses, *there being much cheating in that kind*; neither do I see why a brave man should delight in a creature whose chief use is to help him to run away." This much, I fear, must be granted, that viewing, on the one hand, the improvement of the breed of horses, through the prevalence of the amusements of the *course*, and the influence of an almost universal jockeyship; and, on the other, the demoralizing effects, and ruinous consequences which such pastimes too often produce, it is not quite clear that the result has proved altogether advantageous either to man or beast. That the aristocracy of the country might indulge themselves, with equal eagerness, in more dignified pursuits, is perhaps less doubtful.

Of the number of horses now in Britain, whether for the purposes of peace or war, I can form no notion,—nor are there any exact data from which to calculate their amount in earlier times. Judging from the little we can learn, they appear to have varied greatly in the amount available for the latter pur-

pose, at different periods. Mr William Fitzstephen states, that in the reign of King Stephen, London alone poured out 20,000 horsemen for the wars of those times; whereas in the commencement of Queen Elizabeth's reign, the whole kingdom could not supply 2000 horses to form the English cavalry. Even at the time of the Spanish invasion, when the country was regarded as in imminent danger, all the cavalry which England could then furnish, amounted only to 3000*.

Species 2.—THE DZIGGITHAI.

(*Equus Hemionus*, PALLAS.)

This animal resembles the mule in size and figure, but is much more elegant. It is called *Hemionos* or half ass by Aristotle, and is mentioned by that philosopher as occurring in ancient times. The head is proportionately larger and more compressed than that of the horse; the forehead straight and flat; the lips, especially the upper, remarkably flexible, the chin and region of the nostrils furnished with hair, somewhat in the form of mustaches, about two inches long; the ears are longer than those of the horse, pointed, and gracefully thrown backwards; the neck slender and compressed; the mane, which is brown and soft, extends from the nape to the withers; the body is lengthened, compressed, and arched above the spine; it stands very high upon its legs; its hoofs are black, and half conical; the upper half of the tail is as bare as that of a calf, but it is terminated by a sweeping tuft of black hair, nearly a foot long. General colour greyish isabella. The coat, during winter, is, as it were, tufted like that of the camel; in summer, it is scarcely three lines and a half in length, and is distinguished by radiated marks like ears of corn, scattered here and there upon the flanks.

The existence of this animal in Syria, has been pointed out by Aristotle (Hist. An. l. 6.), and Ælian (l. 16.), describes it as a native of India. The first of the moderns by whom it was recognized appears to have been Messerschmidt; but it is to Pallas that we owe the true illustration of its history. The

* For a detailed account of domestic horses, see *Culley's Observations on Live Stock*, *Marshall's Economy of Yorkshire and of the Midland Counties*, the works of *Buffon*, *Bewick*, &c.

Dziggithai is at the present day confined to the *steppes* of central Asia, and is found especially in the desert of Cobi. It neither penetrates into the forests, nor ascends the mountains. It is said to bear its head and chest loftily, like a stag; its neighing is more grave and sonorous than that of the horse; and it can travel fifty or sixty leagues across the desert without drinking. Its congregated bands never consist of more than about twenty females and foals under one male chief. Sometimes several males are observed together, followed only by four or five females. The rutting season takes place towards the end of August, and the young are produced in spring. There is usually only one brought forth at a time, which attains the adult state in three years.

The chase of this animal is a favourite pursuit, both among the Monguls and Tanguts, but its prodigious and proverbial swiftness, aided by a piercing sight, and an acute sense of smelling, usually baffles their most experienced and best mounted huntsmen. It is sometimes taken in snares, or shot from behind some natural skreen or hillock near a spring. It is valuable on account of its flesh and hide. In the mythology of Thibet, the god of fire is mounted on an animal of this species. As the Kirgis tribes have no name for the Dziggithai, it is probable, that, if it does exist at all to the west of the mountains of Belur, it has not occupied those territories for a great length of time.

Species 8.—THE ASS.

(*Equus Asinus*, LINN.—*L'Ane*, BUFF.)

The Onager, or wild ass, called Koulan by many of the tribes of Asia, is distinguished from the domestic kind by the greater length and finer form of its limbs, its straight chest, and somewhat compressed body. In its general appearance it is said to resemble a young foal. The forehead is much arched, but very flat between the eyes; the head is better set, and carried more erect than in the common ass, and the ears, which are shorter by one-third, are slender and sharp pointed; the upper part of the head, sides of the neck, flanks, and buttock, are isabella colour; the hue of these four parts is circumscribed

by pale whitish bands, which likewise border the mane, which is black. In winter, the coat becomes more waved and woolly, like that of a camel, and of a paler flaxen hue on the isabella coloured portions. A coffee coloured line prevails along the spinal or central part of the back, enlarges on the crupper, and, descending to the belly, separates the colours of the flanks and buttocks. The hair of this dorsal line is bushy and waving, even in summer, when the rest of the coat is perfectly smooth, and the tuft of hair which terminates the tail is about four or five inches long. There is a projecting callosity or wart on each leg. Males alone are characterized by the transverse bar across the shoulders, observable in the domestic ass, and in the wild species it is sometimes double.

The true source of our domestic race, though well known to the ancients, appears to have been lost sight of during the middle ages, and was indeed but obscurely known for some centuries after the revival of learning. We owe the best modern elucidation of its history, as we do that of several other species, to the researches of Pallas. The Romans were familiar with the aspect of this animal. Julius Capitolinus, in the life of Gordien (*in Hist. August.*), observes, that that Emperor brought up thirty onagers and as many wild horses; and in the secular games of Philip, twenty onagers and forty wild horses were exhibited.

The Turkish name of the wild ass, *Dagh Aischaki*, or Mountain Ass, points out its natural locality,—“Whose house I have made the wilderness, and the barren land his dwelling.—The range of the mountains is his pasture, and he seeketh after every green thing*.” Even the choice which the domestic ass makes of the narrow and irregular paths by the wayside, is probably a remnant of natural instinct†. The base on which he is sustained while walking is very narrow, and is produced by the vertical compression of the body,—from which necessarily results greater sureness of foot, while moving rapidly over a narrow surface, than is to be found in those animals whose feet touch the ground at proportionally greater lateral distances. That the ass is a mountain animal, might also be inferred from

* Job. ch. xxxix. v. 6-8.

† Dict. Class. d'Hist. Nat. t. iii. p. 563.

the fact of his hind quarters being naturally several inches higher than his fore ones, which, as in the case of the hare, gives great facility to an ascending course, and is, in the language of modern philosophy, one of the physical necessities of its nature,—that is to say, in language more pleasing, and equally philosophical, it is one of the innumerable wise provisions of a beneficent Creator.

The appearance and manners of the domestic ass, as it exists in this country, are so familiar to our readers, as to render description unnecessary. According to Chardin, there are in Persia two kinds of asses,—those of the country, chiefly used for carrying burdens, and a race of Arabian origin, which are very beautiful, with glossy skins, carrying their heads loftily, and moving their limbs in a very graceful manner. They are used solely for the saddle, and sell as high as L.18 Sterling. We are told by Niebuhr, that their medium pace is equal to seven miles an hour; and, that they are capable of supporting great fatigue, was evinced by the young female mentioned by Pallas, which travelled from Astracan to Moscow, attached to his post-chaise, with only an occasional night's repose. It afterwards proceeded in the same manner, and without being incommoded by the journey, 700 wrests from Moscow to Petersburg.

According to Buffon, the domesticated breed of asses used in Europe came originally from Arabia. They first passed into Egypt, thence to Greece, Italy, France, Germany, England, &c. Those used in Sweden and other northern countries, have been introduced at a very recent period. Even in England, according to Hollinshed, in the days of Queen Elizabeth, "our lande did yeelde no asses." If it were so, they must have become extinct, for there is no doubt of their existence in this country during a period long prior to the golden days of "good Queen Bess." They are mentioned in the reign of Athelred, and again in the time of Henry III. It is highly probable, however, that they were re-introduced into Britain under the reign of Elizabeth's successor, upon the renewal of our intercourse with Spain, a country famous for the production of both the ass and mule.

Neither the scholiast, the metaphysician, nor the natural philosopher, has satisfactorily explained why a certain Roman of

distinction named Crassus, should have never laughed in his life but once, and that at an ass eating thistles, "a circumstance," says Dr Shaw, "in itself by no means ridiculous." There is a passage "curiously majestic," and very characteristic of the author, in Sir Thomas Brown's *Pseudodoxia Epidemica*, which is not unworthy of being quoted in illustration of this point. "The relation of Lucilius, and now become common, concerning Crassus, the grandfather of Marcus, the wealthy Roman, that he never laughed but once in all his life, and that was at an ass eating thistles, is something strange. For if an indifferant and unridiculous object could draw his habitual austereness into a smile, it will be hard to believe he could with perpetuity resist the proper motion thereof. For the act of laughter, which is caused by a sweet contraction of the muscles of the face, and a pleasant agitation of the vocal organs, is not merely voluntary, or totally within the jurisdiction of ourselves; but as it may be constrained by corporal contraction in any, and hath been enforced in some, even in their death, so the new, unusual, or unexpected jucundities, which present themselves to any man in his life, at some time or other, will have activity enough to excitate the earthiest soul, and gain a smile from the most composed tempers. Certainly the times were dull when these things happened, and the wits of those ages short of those of ours, when men could maintain such immutable faces, as to remain like statues under the flatteries of wit, and persist unalterable at all efforts of jocularity. The spirits of hell, and Pluto himself, whom Lucian makes to laugh at passages upon earth, will plainly condemn those saturnines, and make ridiculous the magnified Heracitus, who wept ~~posteriorly~~ ^{posteriorly}, and made a hell on earth; for, rejecting the consolations of life, he passed his days in tears, and the uncomfortable attendments of hell."

The food of the wild ass, according to Dr Shaw, consists chiefly of saline or bitter and lactescent plants. It is also fond of salt or brackish water. Its flesh is highly esteemed by several oriental nations, and its skin is known in commerce under the name of *chagrin*, so called from the Turkish term *sagri*. The engrained aspect which it bears is not, however, natural to

it, but is produced by a chemical process described by Pallas in the second volume of the *Acta Petropolitana*.

Species 4.—THE QUAGGA.

(*Equus Quagga*, GMELIN.)

This animal inhabits the Karoos or flats of Southern Africa, frequently pasturing in company with the zebra, of which it was for a long time regarded as the female. It is not difficult to tame, and is sometimes brought up with common cattle, which it is said to defend from the attacks of the hyæna. The specimen in the Royal Menagerie of Paris used to neigh at the sight of a horse or ass. Its intercourse with the latter was however unproductive. They were observed in great numbers by Delalande at the mouth of the Groot-vis-river, and during the night, used to approach close to his tent. Their cry resembles the name by which they are now called.

The quagga measures about four feet in height at the withers. The colour of the head and neck is deep blackish brown, the other parts are of a clearer brown, growing paler beneath, and on the belly almost white. The head and neck are striped with greyish white lines, which on the cheeks are transverse, but longitudinal on the forehead and temples; they form triangles between the mouth and eyes. There are ten bands on the neck, the mane is blackish, and resembles that of a horse which has been *dressed*, and a black line runs along the spine as far as the tail. This species is more easily rendered subservient to domestic uses than the zebra. “In confirmation of this assertion, it may be observed, that, among the equipages occasionally exhibited in the gay season in Hyde Park, and other fashionable places of resort, may be seen a curricie drawn by two quaggas, which seem as subservient to the curb and whip as any well trained horses. When we consider that this species is thus capable of highly beneficial services in a domesticated condition; that its natural courage is evinced in its wild state, by the manner in which, according to the report of travellers, it expels the hyæna and the wolf, an endowment which would be of great value to the animal if completely subjected to man; that this species is an inhabitant of the hottest parts of the earth, and is therefore

likely to be of service where the horse loses his capabilities by climate, we may naturally be surprised that the quagga has been suffered by us to retain its liberty so long. Naturalists have now, however, discovered the pliability of its disposition, in conjunction with its physical powers, and practical men will probably in time take advantage of the discovery, by adding the quagga to the number of species subdued to the general profit, convenience, or pleasure of mankind." (*Griffith's Cuvier*, vol. iii. p. 465.)

The late Lord Morton succeeded in raising mules between the quagga and the mare, and in the course of his experiments a very singular and unaccountable circumstance occurred. The mare which had given birth to the hybrid or mule, several seasons afterwards, produced a foal, which exhibited in some measure the markings of the quagga, although she had not in the interim associated except with a horse, her natural mate: the quagga, indeed, had been dead for more than a year.

Species 5.—THE ZEBRA, or MOUNTAIN ZEBRA.

(*Equus Zebra*, Lin.—*Le Zebre*, BUFF. *E. montanus*, Burchell.)

This animal, which resembles the mule in shape, is one of the most beautiful creatures in nature. Its head is large, its ears long, its limbs elegantly small, and well placed, its body is well formed, round and fleshy; but the beauty of its shape is greatly heightened by the glossy smoothness of its skin, and the amazing regularity and elegance of its colours, which, in some are white and brown, in others white and black, mingled with yellow, and ranged in alternate stripes over the whole body, in a style so highly ornamental, that it would at first seem rather an effect of art, than the genuine production of nature. The head is striped with fine bands of black and white, which form a centre in the forehead; the neck is adorned with stripes of the same colour running round it; the body is beautifully variegated with bands running across the back, and ending in points at the belly; and its thighs, legs, ears, and tail, are all beautifully streaked in the same manner*.

The appearance of the two sexes is very similar. In the

* Bewick.

young the dark coloured bands of black or brown are paler. The female goes with young twelve months.

The zebra appears to have been well known to the Romans, as Caracalla is said to have slain, in one day, an elephant, a rhinoceros, a tiger, and a *hippo-tiger* *. This last term, which signifies literally horse-tiger, clearly indicates the zebra, which possesses the proportions of a horse with the striped hide of a tiger. Frederic Cuvier has figured and described a mule produced between a female zebra, and a Spanish ass †. It sucked for a year, but as it increased in size it lost its resemblance to its mother, and also became stubborn and mischievous. Its coat is now of a deep grey, varied on the legs, the withers, and the tail, by transverse bands. It never neighs ; loves to roll itself on the moist ground, attacks all the world with its hoofs and teeth, and is in short a very unamiable creature. The inhabitants of the Cape of Good Hope have never succeeded in their attempts to reduce the zebra to a state of domestication. Sparmann records an instance of a rich citizen, who, to a certain extent, had managed to tame his zebras. He one day attempted to yoke them to his chariot, but had nearly forfeited his life for his experiments, as they rushed back to their stalls with every symptom of fury and indignation. Buffon, in his earlier writings, reported that zebras were used in Holland, and had been yoked occasionally to the Stadtholder's chariot ; but in this he afterwards discovered himself to have been misinformed, and he accordingly corrects his statement in one of his supplementary volumes.

Several instances, besides the one above mentioned, are recorded in Europe of female zebras producing mules. The first experiment, with an Arab horse, failed, and asses were tried with no better effect. An ass, the hide of which was painted so as to resemble a male zebra, was then induced to accompany a female of the latter kind, which conceived and brought forth a mule foal. It was shaped like the father, but coloured like the mother, except that the colours were less brilliant, and not so distinctly marked. These experiments were made by Lord Clive, on whose death the mule was unfortunate-

* *Dion Cassius*, lib. 75, cap. xiv., t. 77. c. 6.

† *Mam. Lith.* 15th liv.

ly lost sight of. The attempt was again repeated, more lately, in Paris, with a horse. The female zebra conceived, but died during the eighth month of gestation. The foetus was ascertained to be a male, without hair, but having the head marked with black and white stripes.

M. F. Cuvier mentions an instance of a zebra which was quite tame, and suffered himself to be approached and mounted without difficulty; and Mr Barrow seems to think, that, if judicious means were made use of, this animal might be reduced to an available servitude, notwithstanding its naturally wild and vicious disposition.

Species 6.—THE ZEBRA OF THE PLAINS.

(*Equus Zebra*, BURCHELL. *Equus (Asinus) Burchellii*, GRAY.)

Though our knowledge of this beautiful animal is originally due to the observations of Mr Burchell, who first perceived that Africa produced two species of zebra, we owe the more precise settlement of its distinctive characters to Mr W. E. Gray. It appears, in fact, that Mr Burchell, after ascertaining that there really were two different kinds of this animal, fell into the error of describing the one previously known, as the new species, while he overlooked, or did not sufficiently illustrate, the specific distinctions of the zebra of the plains, regarding it as the kind already well known, although it had, in reality, hitherto escaped the notice of naturalists. "The hoofs of animals," observes that enterprising and intelligent traveller, "destined by Nature to inhabit rocky mountains, are, as far as I have observed, of a form very different from those intended for sandy plains; and this form is in itself sufficient to point out the dauw* as a separate species. The stripes of the skin will answer that purpose equally well, and show, at the same time, the great affinity and specific distinction of the ass, which may be characterized by a single stripe across the shoulders. The quagga has many similar marks on the head and fore-part of the body; the zebra is covered with stripes over the head and the whole of the body, but the legs are white; and the wild

* The Dauw or Wild Paarde of the Hottentots, erroneously regarded by Mr Burchell as a newly discovered species.

paarde is striped over every part, even down to the feet. The zebra and wild paarde may be further distinguished from each other, by the stripes of the former being brown and white, and the brown stripe being double, that is, having a paler stripe within it; while the latter, which may be named *Equus montanus*, is most regularly and beautifully covered with single black and white stripes: added to this, the former is never to be found on the mountains, nor the latter on the plains*.”

It is evident from the preceding descriptions, and the comparison instituted by Mr Burchell himself, that, although he is entitled to the merit of discovering that there were two distinct kinds, he has applied his new name to the old species, and con-founded the new species under the old name. It therefore became imperative that his designations should be changed, because the well known zebra is in fact the *mountain horse*, and Mr Burchell's species is the zebra of the plains. These critical emendations were carried into effect by Mr Gray, in a paper entitled, “A revision of the Family Equidæ,” published in the *Zoological Journal*, vol. i. p. 241 †. The author has there retained the name of *Zebra*, as applying *specifically* to the animal so called by Linnæus and Buffon, and has bestowed the epithet *Burchellii* on the other species, in honour of the traveller above quoted.

The following are Mr Gray's comparative descriptions of the two kinds:

BURCHELL'S ZEBRA.—Body white; head with numerous nar-

• Travels in Africa.

† “This family,” observes Mr Gray, “(which is distinguished from all other animals by its undivided hoof, formed of the two anterior toes soldered together, its simple stomach, and its female having the teats placed on the pubis), may be divided into two very distinct types of form; the one the asses and zebras, which are always whitish, and more or less banded with blackish-brown, and always have a distinct dorsal line, the tail only bristly at the end, and have warts only on the arms, and none on the hind legs; and the true horses, which are not banded, *have no dorsal line*, are furnished with warts on their arms and legs, and have long hairs on the tail, from its insertion to its extremity.” I may observe, that the character of the dorsal line is an insufficient distinction, as it is sometimes (though very rarely) wanting in the ass, and occurs, not unfrequently, on the Norwegian horse and Shetland pony.

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row brown stripes, which gradually unite together, and form a bay nose; the neck and body with alternate broad stripes of black, and narrow ones of brown, the latter of which nearly fill up the interspaces between the black stripes, and only leave a narrow whitish margin. The dorsal line is narrow, and becomes gradually broader in the hinder part, distinctly margined with white on each side. The belly, legs, and tail, quite white; the mane alternately banded with black and white.

Inhabits the flat countries near the Cape.

THE ZEBRA, or MOUNTAIN ZEBRA.—Fur white, with close narrowish black bands on the body, neck, and legs, and brown ones on the face; nose bay; dorsal line indistinct from the others. Belly and inside of the thighs bandless; tail blackish; mane erect, thick, bushy, banded with white; ears with two black bands, and white tips.

Inhabits the mountainous parts of the Cape of Good Hope,—*Burchell*; Congo, Guinea, and Abyssinia,—*Ludolphe*.

The zebra of the plains is figured in "The Tower Menagerie," in which work it is also described (from a specimen now in the Tower of London), as having the ground colour of its whole body white, interrupted by a regular series of broad black stripes, extending from the back across the sides, with narrower and fainter ones intervening between each. Over the haunches and shoulders, these stripes form a kind of bifurcation, between the divisions of which there are a few transverse lines of the same colour; but these suddenly and abruptly cease, and are not continued on the legs, which are perfectly white. Along the back, there is a narrow longitudinal line, bordered on each side with white. The mane is throughout broadly and deeply tipped with black, and is marked by a continuation of the transverse bands of the neck. The lines of the face are narrow, and beautifully regular: from the centre of the forehead, they radiate downwards over the eyes. Along the front of the muzzle they are longitudinal, the outer ones having a curve outwards; and, on the sides, they form broader transverse bands. From the confluence of these bands on the extremity of the muzzle, the nose, and the lower lip, those parts become of a nearly uniform blackish-brown. The tail is white: there is no longitudinal ventral line: and a large black patch occupies the posterior part

of the ear near the tip. The hoofs are moderately large, deep in front, shallow behind, and much expanded at their margin.

The subject above described has been two years in the Menagerie. She suffers a boy to ride her about the yard, and is frequently allowed to run loose through the tower, with a man by her side, whom she does not attempt to quit, except to run to the canteen, where she is occasionally indulged with a draught of ale, of which she is particularly fond *. She may hence be inferred to be a very sensible animal. -

Le Vaillant, in his *Travels*, mentions another species of the genus *Equus*, under the name of *L'Ane Isabelle*, which, however, has never been seen or heard of since. It was in all probability an albino variety of either the zebra or the quagga. As to the cloven-footed horse of South America, the *Equus bisulcus* of Gmelin, called *Gnemel* or *Huemel*, by Molina, there is no reason to suppose that it is a horse at all. It ought rather to be referred to one or other of those species of lama called *Auchenia*.

Let us conclude, for the present, with a few observations concerning mules. Mules, in general, are the hybrids, or mixed offspring produced by two animals of different species; mules, in particular, are the progeny of the horse and ass, or of the jack-ass and the mare.

1st, Of Mules in general.—Animals which, by their union, produce *fertile* individuals, are generally reputed of the same species. This law of Nature, as it was formerly called, having been found to admit of certain, though rare, exceptions, is not now so broadly insisted on as a test of specific identity as it was in preceding times. But it appears from the result of numerous experiments, that the generality of animals produced from a cross between even the most nearly allied species, are either altogether incapable of reproduction, or fertile in so imperfect a degree, that their descendants speedily become entirely sterile. It has been said, that birds alone were unsubjected to this rule, and that hence has arisen the wonderful variety which that beautiful class exhibits. There is no doubt of the occasional

* Tower Menagerie, p. 180.

fertility of their hybrids, as in the case of those mule birds produced between the gold-finch and canary-bird ; but as it has not been proved that such union of distinct kinds ever takes place when uncontrolled by the depraving influence of domestication, there is no reason to attribute the origin of any of those species or varieties which are known to exist in a wild state, to such improbable alliance.

It is known that a productive union may take place between animals of different species, provided such species belong to what naturalists call the same natural family. Thus, the horse and the ass, the ass and the zebra, the quagga and the mare, when paired together, produce young. It is probable, however, that all these unions are so far forced and unnatural, that they never take place except through the influence of man, when domestication, and the numerous changes consequent upon it, have altered or impaired their natural instincts ; for it has been observed, that however education may perfect certain special qualities which man has the art to render subservient to his own convenience, yet a more extended view of the effects of domestication will convince us, that it is almost always to the disadvantage of their natural capacities that the brute creation are made to borrow the mask of human intelligence.

Buffon appears to have adopted from Ray an axiom which many now regard as inaccurate and artificial, but which he made use of to determine the identity of animal species, viz. " Any two animals that can procreate together, and whose issue can also procreate, are specifically the same." In this, however, it has been observed, that he contradicts himself, by afterwards admitting that the sheep and goat are of different species, at the same time that he asserts that the he-goat and the ewe produce a mixed breed, which continue fertile for ever. Dr John Hunter, however, (a great authority), was also of opinion that the true distinction between different species of animals must ultimately be gathered from their incapacity of propagating with each other an offspring capable of again continuing the kind ; thus, the horse and ass beget a mule, capable of copulation, but incapable of begetting or producing offspring. The accident of a mule breeding, according to the same authority, even if it were proved, would only show, that as many perfect animals of true

species and distinct sexes are incapable of breeding at all, thus showing that Nature, even in her greatest perfection, sometimes deviates from general principles, so it may occasionally happen that a mule shall breed from the circumstance of its being “ a monster respecting mules.”

2d, Of Mules in particular.—Regarding these we have little else to say, than that they are more easily bred between the jack-ass and the mare, than between the stallion and the she-ass. The common mule is highly esteemed as a beast of burden in rugged or precipitous countries, and is more valuable than either the horse or the ass for travelling over wild and mountainous regions. They are used in Spain, not only very generally for the ordinary purposes of commerce and rural economy, but by people of the highest rank ; and they frequently bring a price in that country of fifty or sixty guineas each. They are celebrated for the sagacious manner in which they convey men and goods in safety through the most dangerous passes of the mountains.

ON AN IMPROVED USE OF POTATOES. *By JOHN MACINNES, Esq. of Auchinreoch and Woodburn.*

OF all esculent roots the potato is undoubtedly the best entitled to our careful cultivation. Whether we regard it as the food of man or of beast, its excellent adaptation to almost every variety of palate and of constitution induces us to recognize it as one of the very first boons of Providence. When we consider that, either as smoking in solitary importance on the labourer's humble board, or as taking its customary place among the viands of the great, the potato is universally welcome, it can excite no wonder should it have always claimed the particular attention of agricultural experimentalists. Yet to me it seems truly surprising, after all that has been said and written on a subject of such national importance, that this most useful of all known roots should at this day be permitted to retain so low a rank in the science of economics.

True it is, that the uses to which it is applied are numerous, and the benefits derived from such applications duly appreciated,

but still it is apprehended that, in reference to its principal use, that of human diet, much ignorance continues to exist. Now, that at a period when public spirit, as well as private philanthropy, have done, and are doing, so much for the poor and the destitute,—when soup-kitchens and cheap-bread associations, and every plan which humanity can possibly dictate or devise for the alleviation of suffering and want, are adopted, it really does astonish me that the potato has not hitherto been more serviceably operated upon by a discerning community.

This surely proceeds not from any scarcity of the article itself, from its high price, or admitted insufficiency for purposes of wholesome repast: none of these reasons are available. I must then be allowed to impute the apparent apathy manifested respecting the extension of potato manufacture to the yet undiscovered capabilities of this nutritious root.

To this conclusion I am led, owing to several experiments with which I have recently been occupied. These experiments were, indeed, simple enough; but as momentous results are sometimes deduced from principles the least complicated, and as it seems to me that the matter to which I allude is one of paramount interest to society in general, I beg to submit the following brief detail to the consideration of my fellow-subscribers and readers of this useful publication.

During a residence of thirty years in the West Indies, I often thought of the immense advantage that would accrue to our colonies, if rendered independent of America for Negro food.

It occurred to me, that, by manufacturing the cassada root into tapioca, similar to what is done in the Brazils, an adequate substitute might be procured for rice. Impelled by this idea, I embraced a few leisure hours for making the experiment, and I found it completely answered my anticipations. No other emotion was thence excited but that of surprise, on reflecting that such a profitable use of the cassada had been so long and so unaccountably neglected.

This tuberous root, as is well known to those who frequent the Tropics, is fibrous and juicy, and in its shape and properties not unlike the carrot or parsnip. In converting the cassada into tapioca, it must be nicely washed, grated and fired.

Now, as similar causes necessarily produce similar effects, it repeatedly and forcibly suggested itself to my mind, while inspecting this process, that the potato might be treated in the same manner, and with equal consequences. On my return to Europe, I embraced an early opportunity of putting the idea into practice. The mode in which it was so done, together with its issue, I now proceed to describe.

As in the case of the cassada, the potatoes selected for the experiment are thoroughly washed, after which they are grated in a machine constructed for the purpose. The parts thus reduced or grated fall into a vessel placed underneath. From this vessel they are removed, and strained into a tub. On the juice being well expressed for the first time, the fibres are set apart, and cold clean water is thrown over them. These fibres are again put through the same strainer, till the whole of the substance is collected, when they are finally cast aside. On this being done, the contents of the tub, now in a state of mucilage or starch, are allowed to settle. A reasonable interval being suffered to elapse, the old water is poured gently off, and fresh water supplied. After this process of fining and washing, the blanched matter is worked through a smaller strainer.

As formerly, the offals are separated. The starch becomes now much whiter; still fresh water is abundantly dashed over it. When by frequent ablution the surface of this vegetable mass is rendered quite smooth and clean, it is filtrated a third and last time.

The strainer now used is of very fine texture, so that no improper or accidental admixture may interfere. As soon as the starch, thus purified, has firmly subsided, it is spread on a board, and exposed to the open air. The damp speedily evaporates, on which it is, as a security for cleanliness, put through a sieve.

A large circular pan is now procured, and set upon the fire. The farine is gradually put into the pan, till what is conceived to be sufficient for one cooking be supplied. As the natural tendency of the farine, in a warm state, is to adhere to the pan, great care is requisite in constantly turning and stirring it. This is effectually done with a broad flat piece of wood, having a long handle to prevent inconveniency from the heat.

I find that a temperature of 150° Fahrenheit, suits best for perfecting the tapioca. When the farine becomes quite hard, dry, and gritty, it is then ready, and may be taken off the fire.

The manner in which the flour or starch is made into cakes is very simple. As before observed, its adhesive tendency does not admit of baking or kneading unmixed with meal or wheaten flour; I have therefore adopted the following easy method:—

A small wooden frame, nearly square, is laid on the pan; this frame is grooved, and so constructed, that, by means of a presser or lid introduced into the groove, the cake is at once fashioned according to the dimensions of the mould. The frame containing the farine may be almost immediately withdrawn after the mould is formed upon the pan; because, from the consistency imparted to the incipient cake by the heat, it will speedily admit of being safely handled. It must not, however, be fired too hastily, otherwise it is apt to become unpleasantly hard and unfit for mastication.

This precautionary measure being observed, it will be found, that, when thoroughly ready, the bread of potato-flour, even unaided by any foreign ingredient, will eat very palatably. It might thus, from time to time, be soaked for puddings, like the tapioca: or it might be used like the cassada-cake, which in appearance and quality it so much resembles; that is, when well buttered and toasted, it will make an excellent breakfast appendage.

But, after all, I am inclined to prefer the tapioca manufacture, or the method already mentioned of granulating the flour into small particles by the application of fire. It requires less time and fuel than the other; it is also rather more durable; neither is the result always so satisfactory, as considerable experience alone can decide as to the degree of heat to be applied, and as to the actual period when the cake is sufficiently fired. The other plan is not so open to misapprehension, and is, of course, conducted with more facility and effect.

To put the comparative difference between the potato-flour thus reduced to tapioca, and the West Indian or Brazilian tapioca manufactured from cassada, to the test, I ordered a pudding to be made of each. The same ingredients, viz. sugar, eggs, cinnamon, and cream, were scrupulously proportioned to

one as to the other, and when ready, and separately presented for eating, no perceptible distinction could be traced.

In appearance, taste, and flavour, they were in every respect the same. If a sensitive palate were to pronounce a difference, the decision would perhaps be favourable to the home tapioca, as being rather more delicate than the other. This might, however, be accounted for from its discernible freshness.

The Brazilian or foreign tapioca, as is generally known, is mightily recommended by medical men as a most nutritious strengthening food. Its value in this country is ascertainable by the high price asked and given for it. Of its efficacy in stomachic disorders and other physical infirmities, I myself, during my long residence abroad, had ample occasion to witness. My satisfaction, then, on thus finding from experiment and comparison, that the potato was convertible into as valuable a form of diet as the cassava, gave rise to the most pleasing anticipations. From the data obtained, it seemed to me obvious that the use of this excellent root might, by the adoption of judicious means, be easily extended, and even made nationally beneficial. This idea was strengthened by reflecting on the attention paid to the manufacture of potatoes in France.

There the success with which, through this medium, economy and comfort are identified and secured, is really wonderful. The legislature of that country affords the best proof of its sincere concern for the welfare of the community, by the unwearied attention bestowed on this important subject; and such laudable support and approbation are not ineffectual.

It is reported by the Count de Chabrol, in his Statistical Account of Paris, that 40,000 tons of potatoes are annually manufactured into flour within a circle of eight leagues around that city. Thus it is that our neighbours across the Straits are so successful in rendering this most useful root a staple article of salubrious food.

They easily foresaw the advantages that would arise from an accurate analysis and practical appropriation of the potato. Every stimulus, therefore, connected with public gratitude, personal enterprise, or the generous dictates of a feeling heart, was proposed for its dietetic improvement. The attempts made have so far terminated happily. "A patent has been procured at

Paris, a gold medal granted, and other honorary distinctions conferred for the discovery and practice, on a large scale, of preparing from potatoes a fine flour or sago, equal to ground rice, and a *semolina* or paste, of which one pound is equal to one pound and a half of rice, one pound and three quarters of vermicelli, or, as it is asserted, to eight pounds of raw potatoes."

How this mode of preparation is carried on, I am not aware, but of its approved utility the following facts are conclusive ; that the consumption of potatoes is, in Paris alone and its vicinity, as extensive as is stated above by Mons. le Count de Chabrol ;—that large engagements have been made for it by the French marine, where it has been found serviceable as a nutritious aid with wheaten flour, for biscuits, pastry, soups, gruel, and panado ;—and that it is plentifully used, with the sanction of the faculty, in the military and general hospitals.

Now, if so widely beneficial an use be made of potatoes by the French, I see no good or cogent reason why a similar trial should not be resorted to in this country. Assuredly, we have every inducement to recommend and propagate a like experiment. When it is recollected what in this way might be performed for the comfort of the humbler classes, and for the promotion of national economy, the suggestions here advanced would seem to lay claim at least to a portion of our serious notice. These suggestions are neither grounded in the ambitious speculations of a contemplated monopoly, nor in the over sanguine hopes of visionary benevolence. They are the simple conclusions of a plain practical man,—conclusions too, it is apprehended, susceptible of the most useful extension ; for, it will not be denied, that, by the introduction of tapioca into the army and navy, public outlay would thereby undergo considerable diminution. Its enlarged use also in government hospitals, prisons, asylums, poor-houses, and all the ramifications of charitable bestowal, would, I am fully convinced, quickly be attended with the most salutary consequences.

While the gratifying effects of wholesome sustenance would be thankfully acknowledged, the usual expenditure of the establishment would at the same time be lessened. And surely this is a matter worthy our profoundest reflection, at a period when the alarming increase of pauperism, in moving the sympathy, augments the disbursements of the beneficent.

Were the manufacture of potatoes into tapioca to be more generally adopted, it would doubtless, too, lessen our present dependence on the importation of foreign corn. In years of agricultural scarcity, we could always betake ourselves to a native resource. The skilful appropriation of potatoes to purposes of domestic consumption, would ameliorate our rural economy, and in no slight degree exclude legislative interference on articles of necessary subsistence.

But, above all, treating this subject in the view of national advantage and home insular policy, which ought invariably to be regarded as true British policy, how must our interest in its success deepen in connexion with the labour, the capabilities, the claims, and the utter wretchedness of Ireland?

What a boundless field opens here to the eye of the inquisitive philanthropist! No soil under heaven is more singularly favourable for the growth and cultivation of potatoes than that of Ireland,—nowhere else, then, could the manufacture of tapioca be more efficaciously attempted.

Every thinking man who may have given this matter any consideration, must here recognize an unlimited expanse for profitable experiment and benevolent exertion. The supposable practicability of introducing the manufacture of tapioca into Ireland, as well as throughout the whole of the United Kingdom, merits, at all events, some thoughtful regard; nor is this supposition peculiar to myself alone. The impression made upon the mind of Sir John Sinclair, arising from a correspondence I have had with him in consultation upon this scheme, is frankly avowed by the worthy Baronet himself to be decidedly favourable.

With a patriotism the most commendable, that eminent benefactor of the agricultural world communicated these views to his Excellency the present Lord Lieutenant of Ireland. What the result of that communication may be I am unable to say. The estimable Baronet is, however, by thus gratuitously lending himself to so disinterested a purpose, entitled to unqualified praise. So much anxiety, indeed, did he manifest for an extended development of the home tapioca manufacture, that he requested me to send him replies to certain queries concerning the process, together with specimens of the experiments made.

These specimens were so much approved of, that one of them was transmitted to his Grace the Duke of Northumberland, at Dublin; the other to the Admiralty, with a recommendation to order a barrel of it to sea on trial. It is to me a source of no small self-gratulation to be encouraged by the respectable suffrage of so much experimental celebrity as that of Sir John Sinclair.

In a letter recently addressed to me on this subject, Sir John says:—"I think it would be necessary this year, as soon as the potatoes are thoroughly ripened, to carry on a manufacture of tapioca on a great scale. It is an article that would sell well if the price were moderate. It is a more handy way of consuming the flour of potatoes than in meal, for it requires nothing but boiling, whereas baking the potato-flour into bread is a troublesome operation. To make the food stronger, some wheaten-flour or oatmeal might be mixed with it when boiling, and would thus make a most excellent mess, particularly with milk.

"It would be unnecessary to have the raw potatoes brought to the place where the tapioca is manufactured. The flour would only be required, by which the bulk and expense of conveyance would be greatly reduced, and people in the country might feed their cattle with the fibre, and sell the flour for being manufactured into tapioca. It would be interesting to ascertain what quantity of flour a statute acre of potatoes would produce, and what ought to be the price of the flour per pound, so as to yield to the farmer a handsome return for his labour in raising the crop? Potatoes might then be raised in great quantities, where, from the expense of conveyance to the market, they cannot at present be advantageously cultivated."

These valuable hints so kindly offered by the Right Honourable Baronet, I desire to recognize with a becoming sense of the obligation. In pursuance of the suggestion made by Sir John respecting the quantity of flour producible by a statute acre of potatoes, and the remunerating price of the flour per pound, I have come to the following conclusions:—

In assuming as moderately as possible, that the average produce of an acre of good soil is 37 bolls * of potatoes, let us sup-

* The bushel of potatoes weighs 72 lb.; according to these calculations, therefore, 37 bolls per acre are equivalent to 344½ bushels.—EDIT.

pose that each peck, of which 16 constitute a boll, weighs 42 lb. These 42 lb. multiplied by 16, give the amount of pounds in a boll, viz. 672. Then multiply this product by 37, the admitted contents of one acre, and we have a total of 24,804 lb. Now, I found, that, from a peck of potatoes weighing 42 lb., the tapioca extracted, when completely ready for use, only amounted to 4 or $4\frac{1}{2}$ lb. In multiplying, then, 16 pecks by 4, we have 64 lb. of tapioca produced from a boll, and these 64 lb. multiplied by 37, furnish us with a result of 2368 lb. of tapioca in an acre.

Let us next try, by an unexaggerated obvious calculation, how such a quantity would probably remunerate the grower and manufacturer. In putting the tapioca on as low an estimate as possible, I would say let it be sold at 4d. a lb. Now, on multiplying the 2368 lb. by 4d, the sum given is 9472, which, reduced to sterling money, amounts to L. 39 : 9 : 4.

This calculation is of course to be modified according to the state of the market, and the scarcity or abundance of the crop. But, taking it as now proposed, surely the superiority of the tapioca as an article of sale, over potatoes, as usually sold, must be quite evident,—for, supposing that the newly raised potatoes should fetch 12s. a boll, then allowing 37 bolls to the acre, the price of the whole would be L. 22, 4s., leaving a balance of L. 17 : 5 : 4 in favour of the tapioca. I shall abstain from entering into any specific comparison between the expense of labour on both sides; but even giving the higher rate in the scale to the raw potato, yet I may confidently affirm that, after every auspicious consideration is included in its behalf, it will be found by far the least profitable of the two.

The price (fourpence) I have attached to the home tapioca, cannot be regarded as otherwise than reasonable, when it is known that the Brazilian tapioca, which I have shown not to be superior to the former in any one instance, is currently retailed by apothecaries and grocers at from 16d. to 18d. per lb.

It may be reckoned a circumstance of discouragement that so small a quantity of tapioca should only be obtained from so much larger a quantity of potatoes,—but it is to be recollected that the more the potato is reduced, the more nourishing is the eatable material. Limited in quantity though

that material may seem, yet when it is considered that, made into pudding or panado by soaking, a quarter of a pound is sufficient to yield a substantial and delicate repast for three or four persons, its self-recommended excellence must at once be acknowledged.

It is a species of food also that keeps uninjured for years. It is portable, made ready with ease and expedition, and not ate by vermin, nor are the offals themselves lost. The fibres of the potato, rejected during the tapioca preparation, are, when sprinkled over with a little oatmeal, greedily devoured by cattle, pigs and other live stock. This is of course a matter of some consequence to the profit side of such a manufacture.

The foregoing observations are propounded under a deep sense of the personal responsibility thus incurred by publicity. They are hazarded, however, under the shelter of successful experiment, and the consciousness of a sincere regard for the national prosperity. Should the several statements now advanced lead to further inquiry on the subject, and to the realization of even partial good, the author of this essay will consider himself amply rewarded for his pains.

ON AN ELASTIC OR SPRING SHOE, FOR PREVENTION OR CURE
OF CONTRACTION IN THE FORE-FEET OF THE HORSE. *Com-
municated by THOMAS WHYTE, Esq. of Glenesslin.*

OF all the branches of veterinary science, there are none, I conceive, of so much importance as the proper management of the feet of horses,—the fore-feet I particularly allude to, the hind-feet, being generally in a moist, cool situation, are not in so much danger,—and ingenuity itself seems almost exhausted in its endeavour to devise such a plan of shoeing as will obviate the evils so long known to arise from the present system.

The elastic structure of the hoof and sole,—the functions which the internal parts have to perform,—and the alternate expansion and contraction which the foot absolutely requires for the due performance of those functions, and for keeping it in a healthy state,—have offered difficulties, which, it is almost un-

necessary to say, have proved insurmountable, in any attempts hitherto made to form a shoe of *practical every day use*, either for prevention or cure of that universal source of lameness—Contraction.

I need not surely stop here to describe, that each time the horse throws his weight upon his foot, the internal parts of that foot are pressed down, and the hoof expands; when the foot is elevated, and the weight of the animal removed, the hoof contracts; and that the pressure which the frog, by being elastic, experiences, when thus forced in contact with the varied surfaces it is pressed against, greatly assists in this expansion.

The shoe in common use opposes and counteracts all these operations of nature; and is the means of communicating to the sole that deformed concave shape *, in which we usually find it in the feet of old horses. That the pressure upon the frog, above alluded to, has long been known as essential to the healthy state of that organ, is evident from the date of the invention for an artificial supply; but this supply, which could not but be awkwardly afforded, while the shoe bound the hoof, I fear, in most cases, did more harm than good, by its partial application, when the surrounding parts were but very limitedly allowed to act.

Should there still be any doubt upon this subject, the sceptic may satisfactorily have it removed, by examining an old shoe recently taken off. There will there be seen, on the surface next to the foot, a well polished groove, extending both in depth and breadth from the last nail hold towards the heel, and this in proportion as the play of the hoof has been retarded by the last nail hole being placed farther back towards the heel, or farther forward towards the toe; evidently proving that it is the

* However paradoxical it may appear, I am clearly of opinion that this concavity of the sole, and all the evils attendant upon contraction, are rapidly increased in such feet as have been more than ordinarily taken care of, by regular *stopping*, particularly if the disease had commenced before the application. The moisture communicated from the stopping materials softens the sole, and renders it more ready to yield to the compression of the surrounding dry horn. It must give way *upward*, for there are but few instances indeed (particularly in saddle-horses) where both the opposition afforded by the nails of the shoe, and the natural construction of the foot, can be thwarted, by its being forced *down*.

friction of the unconfined part of the hoof that has worn the groove. Should it, however, be alleged (as I have heard of its being) that this indentation is caused by the *weight* of the animal, then we should find the groove extending all the way round the bearing of the crust, which is not the case; neither, indeed, can it be, for it is impossible that any weight, however great, placed upon a piece of horn, could indent so thick a piece of metal.

This point, then, being taken for granted, it must follow, that the hoof of the horse, having concentric action, cannot admit of that action being impeded, without injury to the internal parts; that the inflexible ring, or shoe, now in use, nailed close to the hoof, does impede that action; and, in some instances (where a peculiarity of constitution, or conformation of the foot, is present), disease is generated, even in a first shoeing, and without any external appearance of contraction;—that the longer this practice is continued, with what is called a steep hoof, and strong wall, particularly if the horse is allowed to stand in the stable for days together upon hot fermenting litter, the crust becomes the harder and drier, and it is only the nails, or clips (if they are used), which keep it from contracting;—that, so soon as the old shoe is taken off, the restraint of the nails and clips is removed, and the dried horny matter embraces, in a degree more closely, the internal sensible parts;—that the shoe, being again fitted and nailed to the newly assumed shape of the foot, is there held till the next removal, and so on, gaining each succeeding shoeing perhaps an imperceptible degree of approximation towards the heel, but such as at last may, and very generally does, bring on that state of compression which produces corns, thrushes, inflammation of the laminæ, the navicular disease or grogginess, and sandcracks in the parts of the hoof.

When lameness, from any of the above named effects of contraction, has rendered the animal unfit for work, a temporary relief to the confinement of the common mode of shoeing is sometimes afforded. The diseased foot is kept soft and moist, by immersion in warm-water, or poultices. The jointed shoe is then applied, and being furnished with a screw passing between the heels, it is thus made to expand the hoof by degrees.

It is evident, however, that this shoe is not applicable to *every-day* work. It can only be used when the horse is at rest,

or at grass; and I think I shall be able to make it appear, that, even under these circumstances, it can neither act as a cure nor preventive of contraction.

First, then, in the process of expanding the hoof, by means of this screw, it is plain, that, if there be but one joint in the shoe (they are seldom used with more), and that joint on the toe, the whole circumference of the hoof is not acted upon by opening the heels, but merely a small portion of it, in a perpendicular line from the joints towards the coronet, and back along the sole to the frog; whilst the segments, or quarters of the foot, which generally stand most in need of relief, are still kept in a state of compression within the inflexible portions of the shoe, which are nailed to them.

The next objection to this shoe, as a cure, is, that the heels are not permitted the smallest degree of play, either inward or outward. To whatever point they are diverged by the screw, there they must remain.

And the third and last objection to be stated is,—Suppose the lameness removed, by a month or two's vigilant attention to this stretching operation, and the foot restored to a more natural shape, yet the artificial heat, which it has been necessary to employ, has rendered the hoof more flinty, when cooled, and more liable to collapse, when the working-shoe is again had recourse to. Every one knows the effect of warm-water, or unnatural heat of any kind, when applied to a piece of horn.

I have purposely selected this *anti-contraction* shoe for the subject of remark, as being the one most approved, and more generally used in attempting a cure. The contrivances, however, having the same object in view, are very numerous, and many of them, in my opinion, of more merit; but none, that I have seen, of practical every-day use.

Convinced, as I am, that the present method of shoeing is injurious, I need scarcely say, that, like many others, I have thought much upon the subject, and tried many experiments. It was not till the year 1823, however, that I adopted the plan which I am now about to describe; since which period, till the month of May 1828, when I came to Edinburgh to reside, I have almost constantly used it, both upon diseased and healthy feet, with the happiest results.

Description of the Elastic Shoe, and Mode of applying it.

First, then, take equal parts (as to length, breadth and thickness), of good tough iron, and spring-steel. Place the one above the other, and weld them together. Draw the metals, thus united, into a bar, for one, two, or more shoes; and observe, in punching the holes for the nails, to place the steel-side undermost, that it may be, when on the foot, in contact with the ground.

Before turning the shoe, the piece of metal proposed for the purpose, being already prepared, one-half inch *broad*, and from one-fourth to three-eighths of an inch in *thickness*, is to be marked off with a pair of compasses, one inch and a-half (more or less as circumstances may require) on each side of its centre. From these marks, the piece of metal is to be drawn out in both ends, either with a regular taper, as seen in Fig. 2., or may be made abruptly to assume an equal breadth from the above named marks, as in Fig. 1. For a sound healthy foot, the shoe may now be turned of a complete circular shape (See Figs. 1. and 2.); but, when applied to a contracted foot, it must partake more or less of the contracted shape (Fig. 3.), till the hoof has become circular, by means presently to be explained.

Two very small nail-holes are required in each heel of the shoe, their use being merely to keep the clips (which are next to be noticed) in their place; and four or five larger nails round the toe, with a clip in front, will be quite sufficient to keep the shoe fast and steady.

The shoe is then to be fitted exactly to the shape of the horse's foot, whether round or oblong; and the clips (which are projections made from the substance of the shoe towards its upper surface, Figs. 1., 2., and 3.) are to be minutely adapted, so that those at the heels may apply closely to the junction of the crust and bars; and that, in front, to its seat at the toe.

This last process being carefully attended to, the shoe is again to be sprung open, before tempering, to such a degree as *safety* may suggest for its application to a contracted foot.

The whole is now to undergo the operation of tempering. The toe may be brought back to a purple, or even straw colour; and, from that to the heels, of a blue, or spring temper.

It must appear quite evident, that a shoe, thus formed and tempered, must be elastic ; and that this elasticity will enable the surrounding horny matter to perform the functions for which nature adapted it.

But still there remains a difficulty in the application of this shoe to a contracted hoof, which must form the second head of explanation.

Before giving directions for the tempering of the shoe, I stated the propriety of spreading the heels as much wider than those of the contracted hoof, as safety would admit. Under these circumstances the shoe, being too wide for the hoof, would not apply so as to get the nails driven, without the heels of the former were compressed, or those of the latter expanded. This last being more difficult, I have had recourse to the other expedient ; that of compressing the shoe till the clips came within the extremity of the crust and bars. This may now be effectually managed by means of the small cramp, Fig. 6, within the jaws of which, the shoe being placed, the thumb-screw is to be acted upon, till the heels arrive at the point required, after the shoe has been carefully fitted and bedded, studying to remove any awkwardness or irregularity the horse may have acquired in the position of his feet. A nail may be driven into one of the holes of each heel, and one into the toe, which will be quite sufficient to keep it in its place ; after which the cramp may be unscrewed, and this ought to be leisurely done, till the effect of the expanding spring is seen upon the foot. If all is right, the rest of the nails may be driven, and the foot dressed off ; but should the horse show pain, the shoe ought to be removed, and the spring weakened by the file, from the inside opposite the blank of nail-holes.

The shoe for contracted hoofs could not be managed without the assistance of the cramp, but even for such as are in health, it is of use ; if the heels are sprung a little, it makes the clips apply closer.

The nicety requisite in forming this shoe, so as to produce its most beneficial effect, depends upon the proper adjustment of its pliability to the strength and thickness of the hoof, and size of the horse.

When applied to a healthy foot, great care is necessary to guard against the spring of the shoe overpowering the natural

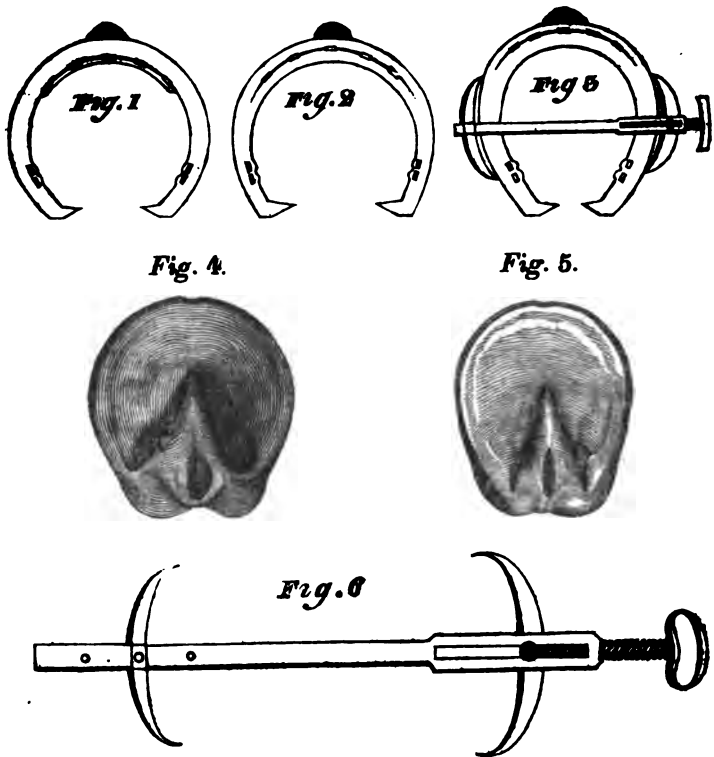
spring of the hoof. These two springs acting as nearly as possible in equipoise, is the point to be aimed at.

If the foot is in an unhealthy state, and greatly contracted, too much ought not to be attempted at once; for should the sensible parts escape being ruptured, inflammation from the overstretching will be the certain consequence. The spring of the shoe may be allowed an increasing advantage over that of the hoof, in each successive shoeing—it must be kept in recollection, that the pressure downwards, from the weight of the animal is *now* brought to its assistance;—but even then, it will require perhaps five or six shoeings before the hoof becomes circular, and the compressed parts fill up, and gain strength and consistence.

The *stopping* which I formerly so much objected to, will now become of infinite service, at least till the soles have lost their concavity, and the feet assumed their natural figure. The reverse of all I formerly stated against the system operates now in its favour.

Under this new method of managing the feet and shoes, the baneful practice of cleaning out the soles, and cutting away the frogs and bars, must entirely be laid aside. That unmanageable and fearful-looking weapon called a *butteris*, is, in the present day, pretty generally done away with; but even the “drawing knife” is permitted to do a world of harm, under the specious pretext (though in my opinion corrupted taste) of making the sole of the foot look neat.

The rasp, pincers, hammer and cramp are the only implements necessary in putting on this shoe; and I would recommend that the drawing-knife should be exploded from every blacksmith’s shop, rather than that there should remain an excuse for its employment to cut a rag from the frog, or a slice from the seat of corns. It is a veterinary surgeon’s, and not a blacksmith’s instrument. In the present improved state of our roads, the protection of the crust requires our care. The sole, in its undressed state, is quite equal to its own preservation. And on the turf, it must be manifest that the narrow webbed shoe has peculiar advantages.



- Figure 1. A shoe for a weak thin crust.
 2. A shoe for a strong powerful crust.
 3. A shoe for a contracted hoof, with the cramp compressing it.
 4. The sole of a sound healthy foot.
 5. The sole of a contracted state of the foot.
 6. A cramp.

Having now communicated my ideas of the imperfections of a system of shoeing which has been practised for ages past, and proposed a new method (in the description of which, with the figures, I trust I have succeeded in making myself understood), I offer it to the perusal of your numerous, scientific, and, I trust, many of them experimental readers; for my sincere wish is, that, under the ordeal of a more extended trial, the favourable anticipations which my single experience has led me to entertain, may be fulfilled, and that, if possible, the sufferings

of one of the noblest animals which the great Creator has lent to the aid of man, may be alleviated.

I have purposely avoided touching upon other systems having the same object in view, as none of them have come into general use. The same fate may attend this, particularly if, in the first attempts, the directions given as to the *strength of the spring of the shoe* are not minutely attended to.

ON STRIKING FIARS OF CATTLE, SHEEP AND WOOL.

IT has always been matter of surprise to us, that, notwithstanding the advantages which have been found to result from the practice of striking fiars of grain, no attempt should have hitherto been made to introduce a similar system to regulate the operations in live stock and its produce; for we believe that, on trial, it will be found that this system will prove as extensively useful in the grazing or breeding districts, as it has been in the grain districts. But while it would be impossible to enumerate the many useful purposes to which the existence of fiars of this description might become subservient, we shall, in this article, confine ourselves to two objects, namely, the equitable adjustment of rent, and the valuation of stock on a change of occupancy.

To every one who has observed the fluctuation in the value of the produce of Highland estates during the last thirty years, and the ruinous consequences attendant on that fluctuation, it must be evident that some standard or other, like that of Fiar Prices, is absolutely necessary for regulating the interests of proprietor and tenant. From the want of such a standard, a proprietor and tenant have at present no other data for fixing the yearly value of a farm for a period to come, than the current prices of the day, (and even these it is at times difficult to obtain with sufficient accuracy), and the consequence is, that, while we see the tenantry of one proprietor in a prosperous condition, we find those of his neighbour on the very verge of bankruptcy; a difference of condition arising solely from the want of that equitable principle in the contract of the parties, by which the tenant would be obliged to give, and the proprietor to take, in name of rent, the real va-

lue of the ground, according to the real value of its produce. We are indeed aware of the anxiety of landlords to have a fixed and permanent rent-roll, with a view to regulate their yearly expenditure thereby, and this, in so far as practicable, is certainly desirable; and we also know that the hardship arising from the fall of prices below those by which rents were calculated, has been attempted to be obviated by voluntary abatements on the part of the landlord. But we likewise know, from experience, that there is no practice connected with agricultural management more to be deprecated than voluntary abatements. It frequently leads, from a mistaken confidence in the will or ability of the landlord, to rash and inconsiderate engagements on the part of the tenant, which often end in disappointment. It is at all times difficult, and often impossible, for the owner of a large estate, to know the circumstances of each individual tenant; and hence, where an abatement is at all given, one invariable rate is generally fixed on, as applicable to the whole tenantry. But while some of the tenants would be well off with an abatement of 10 per cent., there might be others to whom 30 per cent. would be no boon. And even if an inquiry into the circumstances of each individual tenant were to be attempted, it would not always be attended with beneficial results. For, in the first place, motives of prudence might restrain the embarrassed, and probably the most deserving, from revealing his situation; while the most clamorous would be sure of the greatest largess. And, in the second place, it is not often that extensive proprietors have in their employ persons qualified by abilities and integrity to report in matters of this kind. For, as the information must be derived principally through the agency of bailiffs, ground-officers and overseers, of whose characters impartiality seldom forms a part, the best intentions of the proprietor would often be frustrated. It is evident, then, from this very practice of voluntary abatement, that proprietors are satisfied that a fixed and permanent money-rent is not an equitable contract for regulating the value of land for a series of years; and what we have now advanced, shows that the remedy generally applied is not an effectual one.

The most obvious substitute for a fixed money-rent is a produce rent; but, in the present constitution of society, a return

to this standard is out of the question : For we fear very few Highland proprietors of this generation are well qualified, either by education or pursuits, to undertake the collection and disposal of numerous herds of sheep and cattle, or of thousands of stoves of wool ; and, besides, it would be still less advantageous to the tenant, as it would deprive him of the benefit arising from the improvement of his stock, and would become an inducement to him, if not to retrograde, at least to stand still, and substitute numbers in place of quality. We have indeed seen several attempts towards the arrangement of a convertible produce-rent ; in one instance, by reference to the market-price of a particular stock ; in another case, by reference to the determination of an individual ; and, in a third case, by reference to the average price of sheep at a particular market, as reported in a specified newspaper. But it is unnecessary to add, that all these attempts, for very obvious reasons, proved abortive, and led in a short time to confusion and dissatisfaction.

If, however, a commutation into money, by means of *fiar* prices, were once established, nothing could be more simple than the adjustment of a produce-rent ; for the number of cattle and sheep, and the quantity of wool that a farm will produce, being ascertained, it only remains to be determined what number of each of these shall be the rent, according to the *fiar* prices. By this means, a variable money-rent may be determined on by a proprietor and tenant, which bids fair to secure to the former the full value of his land, and to the latter an adequate share of the fruits of his industry, whatever may be the general state of the country at the time. It seems, therefore, unnecessary to use any illustration to point out the obvious advantage that would accrue to both parties from the adoption of this kind of lease. It is a principle already too well understood to require to be inculcated on proprietors, that their own interest, and that of their tenants, are one and the same, and that no encroachment on the capital of the tenant can take place, without ultimately operating against the landlord ; for, as land is now let at the highest rent that it can possibly produce, by the proper application of skill and capital, it must be apparent that any diminution of capital, by abstracting from the tenant more than he can realize, must cause a corresponding diminution of produce.

But further, even in the view of determining a fixed money rent, we conceive that the establishment of an authenticated record of the yearly value of live stock, and its produce, by means of fair prices, would be highly desirable. In this way, the proprietor and tenant have placed within their reach the means of ascertaining the value of stock in times past, and by comparing these with the current prices of the day, and making allowance for any difference arising from the circumstances of the times, they have correct data for calculating the probable value of a farm for a given number of years,—a thing not attainable at present but by long and extensive traffic in the different commodities in question.

It must not be denied, however, that a very serious objection to the adoption of a produce rent, either in kind, or converted into money, as respects a grain farm, has been stated by an able writer on agriculture, namely, that “it necessarily bears hardest on a tenant when he is least able to discharge it. In very bad seasons, his crop may be so scanty as scarcely to return seed, and the expenses of cultivation; and the share which he ought to receive himself, as the profit of his capital, as well as the quantity allotted to his landlord, may not exist at all. Though, in this case, if he pays a money rent, his loss may be considerable, it may be twice or three times greater if the rent is to be paid in corn, or according to the high price of such seasons *.” But how well-founded soever this objection may be, as regards the produce of arable farms, it cannot be urged in reference to the produce of breeding farms: For it has not been found that the value of live stock is materially diminished or increased by a diminution or increase in the supply, but is influenced solely by the demand in the southern markets; and which demand, again, is regulated by the prosperous or adverse state of the manufacturing districts,—the produce of grain farms being the *necessaries* of life, while that of breeding farms may more properly be denominated the *luxuries* of life, which are only to be indulged in, according as we possess the means of conveniently procuring them.

But it is not only as the means of adjusting rents that fairs of live stock would be useful. Another and an equally important

* Loudon's Encyclop. of Agriculture.

object would thereby be attained. Every one acquainted with the management of Highland property, knows that transfers and valuations of stock to a very great amount take place yearly, which are invariably attended with much vexatious trouble, and sometimes with serious loss. The interest of the proprietor and tenant requiring that the sheep-stock, on a change of occupancy, should remain on the possession, its value is ascertained by the appointment of arbiters in the following manner:—Each of the parties, that is, the incoming tenant or the proprietor, and the outgoing tenant, appoints an arbiter; and these arbiters, in case of differing in opinion (which, indeed, they frequently do), have the power, or the parties reserve it to themselves, of naming an oversman, whose award in the matter is final. But, however simple this process may appear in narration, it is the very reverse in practice,—for the proceedings which have been thus detailed in a few words often occupy weeks and sometimes months of mutual bickering and wordy warfare. Such are the disagreeable consequences attending these valuations, that it is exceedingly difficult to get respectable individuals to undertake them, more especially the situation of an oversman, whose nomination is always a bone of contention between the parties, and which, where either of them is disposed to be troublesome, is often ultimately decided by an application to the Judge-Ordinary, who, in his turn, may be awkwardly enough situated, from his limited knowledge of individuals qualified for the task; and he is therefore often obliged to choose, on the suggestion of others, or, with reference to qualifications, frequently selecting one who is unacquainted with the value of sheep-stock, which can only be acquired by practice, and a knowledge of the usages of the particular districts where he may be called upon to act. So that in this way a party may have only his choice of submitting to the nomination of his more obstinate opponent, or of relying on the discretion of the Sheriff, and the judgment of a stranger! And what is the consequence? Very often the loss of the one-fifth part of his property, by the ignorance or knavery of an oversman*.

* We had procured and prepared for being appended hereto, a statement of the valuation of half a dozen of heavy stocks which took place in the counties of Perth and Inverness at Whitsunday last, showing the prices de-

But, supposing the whole parties to meet, having no other object in view than the ascertainment of the real value of the stock, the difficulty is, by what principle is this value to be ascertained? Allowing them to know, with some certainty, the different prices of stock during the preceding season, many circumstances may have since occurred to render these *now* altogether inapplicable. And as the sales of stock-ewes at the House of Muir (the only principal market previous to Whitsunday) seldom affects or regulates the prices of the disposable produce at after markets, valutors have thus no data to guide them in fixing the price of stock, and the consequence is, that their estimate is often so wide of the mark, as to prove ruinous to either of the parties; it being no uncommon thing to see three-year old wedders, for instance, sold in September and October from 6s. to 8s. a head under what they had been valued at the Whitsunday preceding. This of itself is an evil of sufficient magnitude to call for a remedy; and we believe that which we have been pointing out would go far to remove it.

Having thus mentioned some of the more important objects, the attainment of which, the striking of fiars of live stock, and its produce, would greatly facilitate, it remains now to be shown, that there is nothing in the proceedings necessary for carrying the matter into effect, to render it impossible, or even difficult; but, on the contrary, that there are several circumstances highly favourable to its accomplishment. There are two ways in which these fiars may be struck; and although there may be spacious objections to each of them, in point of theoretical accuracy, still we are convinced that a sufficient degree of accuracy is attain-

manded and offered by the different arbiters, and those finally determined on by the oversmen. But, as the publication of such a document might give offence to some of the parties concerned, we suppress it for the present. We may mention, generally, however, that from this statement it appeared, that, in several cases, there was a difference of opinion between the arbiters of from *five* to *six* shillings in the value of a ewe and lamb, worth probably about *nineteen* or *twenty* shillings; while, if these arbiters had been taken to value the same animal, without reference to the interest of third parties, there would not have been a shilling of difference between the valuations of each of them. And yet the valutors were "all honourable men!" But it is not the *men* but the *system* we condemn, and we hope to see it soon abolished.

able, to render them capable of accomplishing many purposes of great practical utility. The most obvious plan for striking these fairs would be, to give power to the Sheriffs of the different counties to have them fixed by the verdict of a jury, as is done at present in the case of grain. But, without any intention of quarreling with the mode in which these fairs are ascertained, we do not think that it would be the most eligible plan for those of sheep and cattle. It is well known, that the greater part of the sales of the sheep and cattle of the Highlands of Scotland takes place at a few principal markets or trysts, such as the Amulree Tryst in May, the Dumbarton Market in June, the Falkirk Trysts in August, September and October, and the Doune Trysts in November; and were clerks of markets to be appointed to attend these several trysts, with power to call before them the sellers and buyers, for the purposes of ascertaining the average prices; and were the mode of ascertaining these prices, and of striking these averages, to be regulated by some known and approved of principle, and made public, to insure their accuracy, we think they would answer all practical purposes, and be infinitely preferable to averages ascertained in all the different counties, or even in a few of the northern ones. For, while this plan would greatly simplify and facilitate the operation, it would be found that the averages thus ascertained would answer the purposes of parties resident at Cape Wrath or the Braes of Lochaber, just as well as those situated in the vicinity of the market itself. And it would be applicable to the occupiers of the barren moors, as well as those of the more fertile straths; for, when once a properly regulated and authenticated average was thus ascertained, contracting parties could make every requisite allowance to suit their own particular case, whether arising from distance, soil, or climate.

It will be kept in view, that, in ascertaining these averages, it would be requisite to have several rates of the different classes of stock; such as, three year old wedders, white faced, best 23s., second 21s., third 19s. 6d., and so on with the different other classes. With respect to *wool*, again, the price of the different clips is so much the same throughout all the Highlands, that the ascertainment of it would be matter of the simplest operation. From these several averages, one general average of

rates, to be called the Fiar Prices, could be easily struck about the end of November yearly, probably by an officer connected with the Courts of Exchequer or Session, to whom the several averages would be remitted by the different clerks, as ascertained.

We do not think it necessary to enter more minutely into the details of the matter at present, as we conceive enough has been said to call the attention of the proprietary and tenantry of the Highlands to the subject; and should they deem it of sufficient importance to deserve a legislative enactment, we have no doubt that, were its practical utility pointed out to the Directors of the Highland Society of Scotland, they would willingly undertake to procure such information as would enable them to draw up a plan of proceeding, so simple and easy of application, as to render the measure at once useful and effective.

PERTHSHIRE, }
Sept. 30. 1822. }

ON SUMMER FALLOW.

FALLOWs are of two kinds, namely, green fallow, so called from the land being cleaned under a green crop, such as beans, potatoes and turnips; and naked, bare, or summer fallow, so named from the land bearing no crop during the cleaning process in the summer season. Green fallow has already been treated of in this Journal, in the paper entitled "Plants cultivated for their roots," in vol. i. p. 271; and as the preliminary operations of green fallow are very similar to those of bare fallow, we propose to confine our attention for the present solely to the latter.

On every kind of soil, the fallowing process should be begun in autumn:—If the weather is dry in autumn, and the land in consequence become hard, the ploughing of the stubble-land should be delayed till it is softened by rain, as it is severer labour for horses to turn over hard soil, and its furrow-slice breaks and appears jagged when laid over; it is probable, too, that the plough may not be able to cut that furrow-slice from the bottom, but may leave part of the land below unploughed. The subsoil

will be left serrated like the teeth of a saw, ready to intercept any percolating moisture. On the other hand, stubble-land, in a green or moist state, is cut clean with the coulter, and turned over with the mould-board with an uniform and unbroken furrow-slice. The object of ploughing in autumn is to smother the surface-weeds, which would grow in mild weather, even in winter, by inverting the surface of the ground; and to expose the earth under the root-weeds to the frost, by turning up the bottom of the furrow-slice to the air. It is clear, that the more closely the inverted surface can be placed, and the more exposed the under part of the furrow-slice can be exhibited to the influence of frost, the better is the chance of smothering the surface-weeds, and of killing the roots of the root-weeds. The advantages of ploughing on good principles have been already demonstrated, in this Journal *, to be obtained, in the greatest degree, by placing the furrow-slice at an angle of 45° with the horizon; and yet a practice prevails in many places, which decidedly runs counter with this principle, and that is,—of laying a loosened furrow right on its back over the surface of a rib of land which is left untouched by the plough. The appearance of this kind of work is that of very ill made drills.

A free soil, in clean condition, which is not wished to be much affected by frost, may be usefully ploughed in this manner, for the purpose of keeping part of the land firm; but, while the furrow-slice receives all the benefit of the action of the atmosphere, the part upon which it rests is prevented from receiving any advantage. These ribs are generally made across the ridges, or at an angle with them; and, on strong land, they form a sort of receptacle for surface-water. This practice deserves, on every account, to be condemned. Light land, on open bottoms, may be advantageously ploughed, crown and furrow, to lie all winter; that is, what is the crown of the ridge at one time is made the furrow at another. Surface-water will not remain so long on such lands as to do them harm, but may assist to consolidate them, and even to irrigate them. Strong clay-lands, on the other hand, cannot be kept too dry in winter; and, as their ridges have a considerable roundness, the best succeeding furrow that can be given

is to cleave down the gathered up ridges, that is, the open furrows of the rounded ridge is still kept the open furrows of the cloven ridge, while the crown of the rounded ridge is made the middle furrow of the cloven ridge; the rounded ridge being, in fact, cloven, or split in two. The furrow-slices of a rounded ridge meet from both open furrows in the crown; whilst the furrow-slices of a cloven ridge depart from the crown to both open furrows, where they are prevented closing up the open furrows by the plough passing up between the furrow-slices, which would otherwise meet from two contiguous ridges. This furrow is called the "gore" furrow. In this state, strong land will lie dry all winter; and this mode of ploughing has the advantage of rendering the rounded ridges quite flat, which is the best position the land can be in for the cross furrow which is to follow. It is found desirable, in working all kinds of land, to plough a succeeding furrow at right angles, or nearly so, to the preceding one, because the land is thus most easily cut to pieces; and as it is the safest state for land to be in all winter, with the water furrows open, the next furrow to the fallow-land, which is given in spring, after the hurry of the spring-sown crops is over, is the cross-furrow, so named from its direction being across that of the ridges. This furrow cutting the land into detached pieces, which cannot resist the pressure of the mould-board, is generally thrown up in an irregular manner, and presents to the inexperienced eye a confused aggregation of lumps of earth. Such a state, however, is well adapted for exposing a very enlarged surface of the soil to the ameliorating influence of light and air; and, if the weather continues dry after the ploughing, surface weeds will receive a check in their growth.

The land should lie in this state till its surface is dry, which is indicated by the earth assuming a light brown colour. In the mean time, the potato and turnip land may be worked. Immediately after the surface of the earth has been "rizzared," or dried in the sun, and before the lumps become too hard from drought, the harrows should be set to work, and break down all these apparently confused lumps into a uniform surface. These harrowings should be repeated three or four double times, at right angles each time, as its great object is to loosen every

kind of weeds, and bring them to the surface of the earth. In light lands, this ploughing and harrowings, more than any other, destroy weeds; and, upon such lands, the weeds should be immediately collected together into heaps by women. On heavy lands, too, they should be gathered at this time; but, in case any fibre or root should be held in durance in the midst of the clods, it is advisable, at this stage of the work, to use a heavy roller to bruize these clods into powder, its operation at this time being the most effectual, as the soil is yet pretty firm; whereas, if the rolling is left to an after period, when the soil has been greatly pulverized by ploughing and harrowing, the roller will press the clods into the soft earth instead of breaking them, and, if they are not broken, it will be impossible to pick off all the weeds from the land *.

The power of vegetation, at this period of the year, will cause weeds to increase very much, and, if not subdued, great additional labour will be required ever after to keep them in subjection. It is a practice with many to cause the cart to carry off the weeds from the land, as the women gather them, and throw them into it; by which arrangement the women are often hurried in the picking up of the weeds, and there is positively great labour in constantly stooping and raising up the body, to throw every handful into the cart. What I think a preferable plan, is always to gather the weeds into small heaps, in a regular line, in the first place, by the women, and afterwards the cart should come and take them away. This mode saves the women some labour, gives time to pick up the weeds cleaner, and saves a considerable time in the work of the horses, which must make many and long haltings, whereas they may be more usefully employed in furthering other work, when the weeds are gathering into heaps. It is also a practice with many to burn these heaps of weeds on the land, instead of taking them off. Such a practice is not commendable. Heaps of weeds, to burn with effect, must generally be allowed to lie in the sun a considerable time, during which a new growth of them is probably making rapid progress in the

* The best kind of roller that can be used either for light or heavy land, is that of a cylinder of large diameter, made of cast-metal, in two pieces, both revolving on the same axle-tree. Its great weight will bruize the hard clods on clay-lands, and consolidate the earth of light soils.

soil, and, in the eagerness to prevent it, the burning process is hastily performed, and many fibres and roots are again spread out, which it had before taken trouble to gather. Besides, all the manure which they afford as ashes is very trifling, compared to the mass of compost which they will yield either with lime, marl, or dung. "What better policy," asks Lord Kames on this subject, "than to make a friend of a foe?" This compost of weeds may be used in the spring in the same field from which they were taken, or applied with advantage to some bare piece of ground or hillock in a neighbouring field of the farm.

At this period of the fallowing process, drains may be most advantageously cut in the field, and any small stones that may be lying on the surface should now be taken off as obstructions to future work, and deposited at once in these drains. Large landfast stones may now be taken out to form foundations to stone dikes, or blown with gunpowder, and their small pieces put into the drains. It is not, however, with the gathering of small stones as it is with weeds; the former must be thrown into the cart at once, as gathering them into heaps does not expedite their lifting afterwards, they having, at all events, to be lifted again singly; whereas whole heaps of weeds which have taken great trouble to gather singly, can be put into the cart by the "graipe," a large three-pronged dung fork, with a short handle like that of a shovel.

The furrow to be given to the land, after this cleaning process, must of course be in a line with the ridges, in order to cut the former furrow, which was ploughed across, and this may be done by ploughing the ridges either singly, or two, four, or six of them together. The latter is fully the better plan, as it serves to keep the land flat, that is, it will not interfere with the future regular appearances of the ridges when they are gathered up. After harrowing this two double times at least, rolling and hand picking weeds must be repeated with great care; as the weeds being now not so numerous, and many of their roots having been broken by the plough and the harrow, they may be easily overlooked in a hurry. Every visible joint of quicks, and every separate knot of knot-grass must be gathered. Colt's-foot, docks, and thistles, must also be carefully rooted out and carried off. Light lands will seldom require more than this ploughing to make them clean, as the weeds in them readily

part with the earth from their roots, and rolling will probably not be again necessary. It is almost certain, however, that strong lands will require another furrow, which may be one across like the second, but only the furrow slices of it reversed, or an angle furrow begun at one corner of the field, and continued to the opposite one in an oblique direction to the ridges. In the cross and angle ploughings, and in ploughing the land along the ridges after the winter furrow, spaces for ploughing, called "feerings," of generally thirty yards in width, are marked off, to save time in ploughing, to avoid many open furrows, and to keep the land level. Harrowing must again follow, and, if necessary, rolling, and hand-picking weeds, and gathering stones must also be repeated.

After all these operations have been performed, the land should be clean, if the weather has not been so moist, and warm and sunless, as to encourage, instead of checking, the growth of weeds. It is here necessary to caution the young fallowist in regard to strong clays. Should the weather prove wet, or likely to be wet, it will be improper to risk strong land so long out of the ridge, as if it be caught by much rain in a flat state, it will become soured before it be so dry as to permit the horses again upon it. One cross ploughing may be obtained in the spring, or early in summer; but rather than risk any more, it would be better to plough the ridges together, backwards and forwards, casting them out, and ploughing them together alternately. In this way the furrows are always kept open for the passage of water. In such a season it will be vain to attempt to clean land thoroughly. At this stage of the work, the four-horse plough may be advantageously employed on loamy lands that are worn out by miscropping. It will bring up fresh soil, which has not seen the light of day for many years. If the subsoil be a clay which the plough brings up, it will make an excellent mixture with the scoured loam. This is the period of the work, too, for using the levelling-box, an instrument useful in giving a uniform skin to old irregularly ploughed lands, and in filling up small hollows into which water might collect, which otherwise create trouble in cutting many unnecessary channels. An overgrown rich head ridge may be easily and effectually carried a short distance to a poorer part of the field. Up to this period the preparation of the land for bare fallow and turnips is the same.

The next process in fallowing is to form the land into ridges, so that it may be ready to receive the lime or dung, or both. Land is restored to ridges, by placing poles in the exact line of the former ridges, and throwing open a wide furrow in the line of the poles, which is closed again when the ridge is to be ploughed. This ploughing is always a gathering up. On light lands this gathering up, or crown and furrow, is all that is necessary for the seed furrow, and it covers the lime and dung at the same time; but, on strong soils, a gathering up is generally given before the lime or dung is applied, as it is necessary to keep such soils well rounded in shape, to prevent the rain or melted snow in winter injuring the wheat, or souring the land with stagnant surface water. Lime may be spread on the land before or after the dung is applied. If both are to be spread on the land at the same time, lime must be laid on in precedence to the dung, and it can be done in two ways, either in small heaps of lime-shells, taken out of the cart and placed at regular intervals between the feerings of the ridges, and left to slack there by the weather, or previously artificially slacked by water; or spread out of carts by shovels, taken from large heaps, containing about five cart-loads each, which had been placed at intervals on the head-ridges, as it had been driven in shells from the kilns or ships. The latter is the best plan, as the driving of it does not interfere with the working of the land, and lime always slacks most equally in large heaps. A man with a single horse-cart, and lime-shovel at each heap, will spread over a large surface of land in a day, especially if one set of carts is filling at the heaps, while the spreader is emptying the other, and the full cart taken to, and the empty one taken away from, him. As a matter of precaution, from the injurious effects of the causticity of the lime, the spreader should cover his face with a piece of thin linen or silk napkin, and the hind part of the horse should also be covered. A calm day, or the wind blowing on the side of the cart, is the best kind of weather in which to spread lime on land. Whenever the lime is spread, it must be immediately harrowed in whilst it is dry, as rain soon renders slacked lime an adhesive mass, which will not trickle down into the ruts formed by the harrow teeth, which it should do, to mix with the soil.

A is the fallow field which is to be dunged, which may be in the flat state, where the land is of a light nature, or gathered up at once, if it be a strong clay. A plough *a* goes a little before the operation of dunging commences, and forms a few drills like turnip or potato drills, across one corner of the field. A dozen of such drills made in advance will suffice, and they need not be made with scrupulous exactness. Single horse carts *c* take the dung from the dung-hill *d*, and a man is ready to pull out the dung from the cart, and deposite it in heaps in the middle drill of the three which the horse and cart occupy. One woman *e* comes immediately after and divides these heaps of dung, with a light ordinary graip, into the three drills only. Three women *f*, *g*, *h*, then follow, one in each drill, with a light graip, like a three-pronged fork, and spread the dung equally along the three drills. Ploughs then come down the drills in the direction of *b b*, and cover up the dung with one furrow, which they can easily do, if the drills do not exceed twenty-six inches apart. The ploughs return upwards in the direction of *K L K*, and form the new drills to be dunged with one furrow also, throwing up the drill towards the smooth land.

Thus the ploughs encircle the carts which are always depositing the dung in the new made drills; and in this manner, one part of the work pushes on the other, and the whole proceeds with alacrity and precision. Women can spread the dung, help to fill it, and drive carts to the man who pulls it out. The same man constantly pulling it out, will deposite the dung with great regularity. In this way, I have seen six pair of horses, with the assistance of women, drill up, dung, spread, and cover in fourteen imperial acres in one day. In a dry season, this is an admirable plan to ensure the dung being covered in quickly. Every operation of fallowing, including this, may be concluded by the end of July, after which the land lies with the dung in it till seed time. At that time the drills are harrowed across a double time, the ridges then scered, lime spread on and harrowed in, and the land lightly seed furrowed; all is then ready for the seed being sown on it at the first favourable opportunity. Wheat is the kind of grain which is almost always sown after the expensive bare fallow, as the crop which yields the most valuable return from the land. Sep-

tember and October are favourable months for sowing fallow wheat. It may be sown after the green fallow of beans, potatoes and turnips, till November, and in spring, not later than March. A safe and expeditious mode of pickling wheat to prevent smut, has already been described in vol. i. page 59. of this Journal. When wheat is sown, the greatest quantity of harrowing which it requires even on strong land is three double times, once along the ridges, when the seed is said to be broken in, another across them to fill up the open furrows, and a third along the ridges again as a finish. Too much harrowing is not good for wheat, as the rough clods left on the surface of the soil moulder down by frost in winter, and fill up the soil to the roots of the young plants, which are thus encouraged to sprout out. The open furrows should then be cleared out with a double mould-board plough and single horse. Cuts should be made across all hollows and head ridges into which water may be suspected to stand in winter, and these, and all the ends of furrows at the ends of the ridges, should be carefully cleaned out with the spade, and all the shovellings should be thrown back from the edges of the "graepe," or small ditches, which are thus made temporary canals to carry off superfluous water. This finishes the laborious work of summer-fallowing, and upon the whole, a well finished fallow-field after wheat seed-time, is as neat and clean a piece of work as the husbandman can exhibit. When he has got all his crop safely in and covered, his stack-yard gate closed, and the wheat sown on the fallow land, he may sleep soundly on his pillow, and pray "Heaven to be gracious, for now laborious man has done his part."

The following remarks are offered as illustrative of the foregoing operations:—

Experience would soon teach a man, when he was necessitated to raise the greatest possible produce from the land to meet the urgent demands upon it, that the existence of weeds in the land was injurious to his crops; that weeds which are the natural production of the soil were more easily fostered with manure, and less liable to be affected by the vicissitudes of the weather, than the cultivated corn crops. He would soon discover that it was not by a repetition of these corn crops that the weeds would be subdued; but that, on the contrary, every year would

only give additional strength to them, so that in a few years the ground would be so matted together by the interlacing of their roots, that no tender plant, like any of the cultivated ones, could possibly penetrate through such a mass of living net-work. Experience would soon teach all this. And yet in spite of this experience, which must be within the reach of every man who cultivates the ground on a large or small scale, the slovenly practice of allowing weeds to grow on cultivated lands, is too much countenanced in the agriculture of these islands. Corn crops must be sown early in spring; and as the whole summer is required to bring them to maturity, winter can be the only period of leisure, under such wretched management, in which the land can be cleaned; but to attempt to kill weeds in a season when the progress of the plough and harrow is generally arrested by rain or frost, is impracticable.

But, though the land cannot be worked to advantage in winter, it may be done so in summer, and in order to be able to accomplish this, and raise a crop of some kind at the same time, it is expedient to raise a green crop such as beans, potatoes or turnips, which being set in drills or furrows, so far apart from one another as to permit the passage of men and horses through the crop, a facility to the cleaning process during their growth is obtained. This culture of green and white crops alternately, is a successful expedient in checking the growth of weeds, in maintaining the fertility of land, and in enjoying the benefit of a crop. But still experience, that hard and uncompromising master, places an obstacle to the success of even this plausible expedient of man. He still finds that weeds do thrive very luxuriantly amongst his beans, potatoes, and turnips; and that being the case, it is hopeless to sow, among these weeds, a succeeding corn crop with any prospect of a plentiful return. What, then, can he do? Fortunately another alternative remains. He can forego the sowing of a crop for one season, and try to clean his land in summer when the power of the sun's rays can wither those noxious weeds, after they have been dragged to the surface of the ground by judicious operations. He no doubt thinks this a hazardous experiment, and a great sacrifice, to forego a whole crop for the sake of some paltry weeds. But how can he help it? Paltry as these weeds are, they effectually prevent

the growth of his crops, and he is driven to this expedient by sheer necessity. He must clean his land, or lose the greater part of his labour in cropping the soil. This alternative will not permit of hesitation. Hence, then, the object of all fallowing is to clean the land, and hence also no fallowing but that in summer will effectually do it.

Some writers maintain, that bare fallowing is not necessary on any kind of soil, as judicious management will prevent an influx of weeds. These writers may be characterized as theoretical; they have not learned their wisdom in the school of experience. To conciliate these authors, others have maintained that bare fallowing is absolutely necessary on strong clay lands, though they admit, that soils which can produce turnips need not be subjected to this comparatively useless and expensive mode of management. It is very true that turnips,—a crop which need not be sown, at the earliest, till the middle of May, by which time, in ordinary season, light land may be nearly cleaned,—are in many cases an excellent substitute for bare fallow, for a limited period of years on the same land. It is also true, that in the neighbourhood of large towns, where the command of putrescent manures is unbounded, soils of even a tenacious nature may be so ameliorated or made loamy, as to assume the character of a lighter soil, upon which green crops may be advantageously raised for the retail market in town. These admissions may be easily made; and yet the propriety of maintaining the necessity of bare fallowing in the rotations of husbandry may remain unaffected; for, let theoretical writers say what they please, and let the expedients of man be what they may in extraordinary circumstances, no man can maintain the fertility, and of course the productive powers, of his farm, of whatever nature the soil of it may be, for any length of time, and exclude bare fallowing from the rotation. Let him be as clever a farmer as ever had the management of land, he cannot possibly keep his land clean in this humid climate by continual cropping, a climate which exhibits little fine weather in spring. All the art of husbandmen cannot possibly avert the injurious effects of a precarious climate. That art has undoubtedly accomplished a great deal to ameliorate the climate, but it has its power limited like every other, and here summer fallowing seems to be a *sine*

qua non in the rotation of British and Irish husbandry. On soils recumbent on a porous substratum, operations may be early begun in spring; and, if the season is not very wet, they may be made only tolerably, but not perfectly, clean by the middle of May or June, when the turnip sowing is finished. If the succeeding summer is dry, though showery, surface weeds may be destroyed by scuffling and harrowing, though root-weeds will grow among the dung, along the drills of turnips, in spite of every effort. A strong crop of turnips, however, and part of it eaten off by sheep, assist very much in clearing the land even of root-weeds. On strong clay soils, and on lighter soils on retentive bottoms, it is impossible to begin work early in spring in any season, and particularly in a wet one; and if the succeeding weather becomes very dry, which is frequently the case in this country in March, such land gets so hard, that the pulverization of the soil, by harrowing and rolling, which are necessary for effectual cleaning, cannot be accomplished in time for the turnip crop; especially as it is found that a rapid succession of similar operations, on the same piece of ground, does not work the land so beneficially as the same quantity of labour bestowed at intervals would do. Light and air must get time to unite with the soil; and we are always told that these elements are necessary ingredients in the food of plants. That the season for sowing the green crop may not be lost, it must be sown in whatever state the land may be, if sown it must be at all, on strong lands.

In order to show more forcibly the difficulty of cleaning heavy lands for green crops, let us take a review of the time of the year in which these crops should be sown. On clay lands, beans must be sown in March at latest, and before that period of the year no one can pretend to clean land at all. Finding it impossible to use them as a fallow crop, they are sown without dung on that part of the rotation which is penultimate to a bare fallow. On light lands, beans will not carry much straw without manure, and their utility as a crop in the rotation is, of course, thereby much decreased on such soils; and if they are to be sown as a fallow crop with dung on the land that is to be appropriated to fallow, they give much less time for the preparatory cleaning of the land than turnips, as they must be

town at latest in April. On all kinds of soil, potatoes must be planted by April, and the same observations will, therefore, apply to them as to beans as a cleaner of the land. It is only from their great value as human food, and from their inability to grow without dung, that they are planted as a fallow crop; because it is impracticable to keep land clean, and much more so to make it clean, under a potato fallow. Thus, there is difficulty in cleaning land, without summer fallow, with beans and potatoes on every kind of soil in any spring, however favourable; and it is quite impossible to do so in a wet one. There is also difficulty in cleaning strong clay land even by turnip time in May; and the greatest facility which a farmer possesses of cleaning his land, or keeping it clean, under a green crop, is by a turnip one, on a light soil resting on an open bottom, in a dry season. This last instance amounts, in fact, to all the boasted possibility of keeping land clean by green crops, without the assistance of bare fallow. But even this substitution is only an approximation to cleanliness, for every one knows, who has farmed light soils for a series of rotations, whatever his practice may be, that even the turnip crop cannot be raised on them for an indefinite period, without the land getting foul with root-weeds, such as quicks and knot grass; and no better mode of extirpating these formidable robbers of the artificial nourishment of the cultivated crops, than by bare fallowing, has yet been discovered. They are the rooks of the soil. Indeed, the practice of the best farmers of light land, however great their desire to curtail the extent of bare fallow may be, is, to have a portion of the land under fallow, though the extent of it may no doubt be limited by the want of manure, from a desire to keep their land clean; and this is accomplished by summer-fallowing that portion of it which had carried potatoes in the preceding rotation, and raising the potatoes and turnips on that part which had been previously thoroughly cleaned by summer-fallowing.

This is a good practice, not only as a means of keeping land clean, but as following out that system of alternate husbandry of white and green crops, which has, by abolishing a succession of white crops with their scourging effects, tended more than any other to render the soil of these islands all alike fertile. But will summer fallow keep land clean? Undoubtedly it will, if

properly performed. It gives the opportunity of working land in June and July; when every crop should be in the ground, and when the sun is so powerful, and the atmosphere so warm and dry; as to kill every plant that has not a hold of the ground. The process already described, of ploughing, harrowing and rolling, according to the state of the ground, is admirably adapted for cutting the matted land in pieces, for shaking the detached lumps of earth asunder, and for bruising to powder every hardened ball of earth into which the fibres or roots of weeds might penetrate; and the hand-picking carries off every bit of weed which might possess any latent vegetative power. Land that cannot be cleaned under such favourable circumstances as to season, must either be excessively foul, the season very wet and cold, or the fallowing process be conducted with great slovenliness. It must be confessed, that fallowing is too often worked very negligently. It is thought by some, that the land can be cleaned at any time before seed-time in autumn; and other things of less importance too often attract the attention from the more important fallow; that weeds, though they do grow, can be easily ploughed down, and that the ploughing of them down assists to manure the land. Such thoughts too often prevail over better knowledge; and they furnish a strong argument in favour of increasing, rather than of diminishing, the means of cleanliness. But such thoughts display, in their effects, great negligence and ignorance,—negligence in permitting any weeds to cover the land, particularly the root-growing ones, by which the strength of the soil is exhausted, and in losing the most favourable part of the season to accomplish their destruction,—and ignorance, in thinking that weeds ploughed down afford nourishment to the soil, when that soil has been exhausting itself in bearing the crop of weeds.

These are facts which are known to every practical farmer; and the nature of which press upon him a conviction of the necessity of summer fallowing more strongly than all the arguments that can be most speciously drawn, by analogy, from the practice of other arts. Reasoning from analogy is feeble when opposed to experience. Gardeners, no doubt, raise crops every year from the same piece of ground; but their practice is not quite analogous to that of the husbandman. They apply a great

quantity of manure to the soil, and they permit few or no plants to run to seed, the bringing of which to perfection, in the cereal crops, constituting the great exhaustion to the soil. Gardeners, however, do something like fallowing their ground at stated periods, as, every three or four years, they dig the ground a double spit of the spade in depth, and lay it up in winter to the frost; and they reserve alternate pieces of ground for the support of late crops,—all which practices approach nearly to our ideas of summer-fallowing.

All these remarks may appear trite to some practical readers. To such I would address the words of a practical writer:—“The world is always in a state of pupilage; some are learning what others know: and the observations which to the young are interesting, are to the experienced and wise, trifling and superfluous. So it must be with essays on agricultural subjects, which can only be directed to the general instruction of the inexperienced; while the practised and sagacious agriculturist must be requested to pardon the particularity with which things well known to him are so tediously written down*.” But how trite soever they may be, they are called forth in consequence of some remarks by a pleasing and interesting writer on Irish agriculture, the Reverend Edward Johnston, in the first volume of this Journal. In the paper of “Hints for the Small Farmers of Ireland,” at page 720, after noticing the great dearth of manure in Ireland, and, at the same time, remarking on the bountiful supply by nature of substances which, by judicious management, might be converted into useful manures, he recommends “the substituting of green crops to be ploughed back again into the ground *instead of fallowing*, a practice *still too common in many parts of Ireland*.” Had Mr Johnston recommended fallowing to the farmers of Ireland as a means of increasing the fertility, and of course the productiveness of their soil, and the raising of green crops to their proper use, that of increasing and fattening their live stock as a source of manure, as suggested in a note by the Editor, I should not have taken up so much valuable space in this Journal. As it is, I would earnestly recommend to Mr Johnston to impress upon the minds of his agricultural country-

* Holdich's Essay on the Weeds of Agriculture.

men, the absolute necessity of keeping their land as clean as possible, as a source of pleasure as well as of profit to themselves; and to assure them, that no means as yet devised by man possesses the same power as summer fallow, of making and keeping land in a cleanly condition. Let them be also assured, that here in Scotland, whose husbandry is allowed to have arrived at an equal degree of perfection with any in the kingdom, summer fallow cannot be avoided with impunity, and much less can it be abolished in Ireland, whose warmest friends even admit, that much yet remains to be accomplished in agricultural improvement. Let them peruse attentively the above description of the fallowing process, from which, though imperfectly executed, they may derive as many practical "hints" as will enable them to appreciate its usefulness and advantages. Ireland is yet destined to act an important part in the agricultural business of these islands. She it is who ought to receive the golden treasures from England, which are yearly pocketed by the serfs of Europe, and there will be no doubt of her receiving them, and of spending them worthily; and, were she in earnest to set about establishing a generous system of agriculture, one means, however humble, of arriving at so desirable a state, is, through the personal influence of such writers as Mr Johnston, assisted by the practical lessons promulgated through the pages of such a Journal as this.

H. S.

ON BONE MANURE. *Report of the Doncaster Agricultural Association*.*

THE many excellent agricultural associations formed in almost every part of the kingdom, are adapted, in the happiest manner, to keep alive the spirit of improvement, and to stimulate the powers of invention and industry. Of the means by which the good purposes of such institutions may be promoted, the collection by them of useful facts, through the influence they possess in the districts with which they are connected, may be regarded as a very important one. The Doncaster Agricultural Associa-

* Report of the Committee of the Doncaster Agricultural Association, on the advantages of Bones as a Manure, founded on returns received in Answer to the Queries issued by the Committee. Ridgway, London, 1829.

tion; acting upon this view, have issued a series of queries on the subject of Bone Manure; and, with great propriety, communicated the result to the public, in a brief practical report. The employment of bones as a means of enriching the soil, is, we apprehend, one of the most important discoveries that have been made in modern times, as regards the operation of manures. It affords us the power of employing, in the most beneficial manner, a substance which would otherwise be useless, and of laying other countries under a contribution for fructifying the soil of our own. In Scotland, we are perhaps more impressed with the high value of this manure, than even our agricultural friends in England. This may arise from the knowledge of the practice having been with us more recent, and perhaps from the effects having been still more remarkable. In Scotland, the application of the ground bones has almost universally been to the turnip land sown in drills, with the seed deposited immediately upon the bones. In this manner, we might infer, from analogy, that the manure possesses the greatest power in stimulating the vegetative powers of the plant. We observe, on the other hand, that a much greater diversity has existed in the practice of English farmers, and that, in several of these modes of application, either no good effect, or a comparatively slight one, has been produced. There is one mode of applying it, however, mentioned by the Doncaster Association, which is not at all in use in Scotland, but which is greatly extolled by those who have practised it in England. This is by mixing the bones, in a crushed state, with other substances, and so forming a compost. But we shall better show the various modes of applying the substance, by an extract from the Report itself, in which the inferences drawn from the various communications received, are given.—“On dry sands, limestone, chalk, light loams, and peat, bones are a highly valuable manure: They may be laid on grass with good effect: On arable lands, they may be laid on fallow for turnips, or used for any of the subsequent crops: That the best method of using them, when broadcast, is previously to mix them up with earth, dung, or other manures, and let them lie to ferment: That, if used alone, they may either be drilled with the seed, or sown broadcast: That bones, which have undergone the process of fermentation, are decidedly supe-

rior to those which have not done so: That the quantity should be about twenty-five bushels of dust, or forty bushels of large, increasing the quantity if the land be impoverished: That upon clays and heavy loams, it does not yet appear that bones will answer."

It is a remarkable circumstance, that complaints are frequently made this season of bones having been less effectual than in former years. This is ascribed to the extreme wetness of the season, and allows a curious inference to be drawn, confirmed, indeed, by the Doncaster report, of the little effect of bones on such soils as by their constitution are retentive of moisture. A circumstance yet more singular has been mentioned to us by some intelligent farmers, who have tried bones on the largest scale for turnip cultivation, which is, that a certain quantity only is necessary to produce the greatest effects; and that no increase beyond that quantity produces any visible result upon the produce. The experiment has been made by varying the quantity of bone-dust in contiguous ridges of turnips, as by having 20 cwt. in one ridge, 40 in another, and a larger quantity in a third, and so continuing this difference over a considerable tract of ground. Whether this law, if it can be so termed, be general—under what peculiarities of situation it has been traced—or how far it may be modified by circumstances—we are not yet informed.

We refer our readers to an excellent essay on the subject of bone manure, by Mr Watson of Keillor, in one of our early numbers,—to some communications by Mr Sinclair of London,—and to the simple and efficacious machine described in the last volume of the Highland Society's Transactions, for preparing the raw material. We shall not lose sight of the subject, but endeavour to furnish such useful information regarding it as occasion may require.

ON RECLAIMING AND COLONISING THE BOGS AND WASTES
OF IRELAND.

1. *A new and easy system of draining and reclaiming the Bogs and Marshes of Ireland.* By R. MONTEATH.
2. *Observations on the benefits arising from the cultivation of Poor Soils.* By W. JACOB, Esq. F. R. S.
3. *Colonies at home, or means of providing for the Poor Population of Ireland, by the cultivation of the Soil.* By W. ALLEN, F. R. S.
4. *An account of the Poor Colonies of the Benevolent Society of Holland.* By a Member of the Highland Society of Scotland.
5. *De la Colonie de Frederiks-Oord.* Par le BARON DE KEVERBERG.
6. *Proceedings of the Society for the Improvement of Ireland.*
7. *A Practical Treatise on the Rural Affairs of Ireland, with Remarks on the reclaiming of Bogs and Wastes.* By JOSEPH LAMBERT, Esq.

THE attention of all the speculative agriculturists of Ireland has been, of late, almost wholly directed to the reclaiming and improving of the bogs and waste lands of this country. Although our population be not greater than the country can support, nor perhaps within many millions of the number which it could maintain in comfort and plenty, yet it is certain that a prodigious number are at present suffering under the extremity of indigence, without any apparent means of relief, unless some new demand for profitable labour be devised. Ireland is as yet essentially an agricultural country, and so it ought at present to continue. Great Britain and she have no separate interests, and while the trade of England and of the world is overdone, it would be wasteful and ridiculous excess to add to that which is already unprofitable from its superabundance. It is quite enough for the English people, with all their coal and iron, to gain nothing more by being cunning artificers of cotton and wool for foreign markets, than to buy and sell, and *live by the loss*; it would be sheer folly to attempt to introduce into Ireland an extensive foreign manufacture, at a time when that

game is overplayed already, by a country of which we are a part, and which is possessed of so great natural and artificial advantages, over every other in the world. We have not the least ambition to see Ireland resemble the manufacturing districts of England, for we think her character, her innocence, and her happiness, would suffer by the change. The emigration scheme seems in but middling odour with any party now, and, notwithstanding the pregnant evils which the economists, who adopt a mode of reasoning opposite to that propounded by Lord Bacon, foresee from the cultivation of poor and unproductive soils, that is the measure very generally proposed to be resorted to at present. The evidence adduced before the Select Committee on the Employment of the Poor, the Emigration Committee, and other Committees of the House of Commons on Irish Affairs, established an exceedingly strong case in favour of the practicability and expediency of expending labour on the drainage and improvement of bogs and wastes in Ireland, with a sure prospect of ultimate gain. Mr Nimmo, the Government engineer, a man practically conversant with all the details of improving unprofitable land, and who had actually reclaimed a piece of ground for Lord Palmerston, stated that nearly the whole of the waste land of Ireland is reclaimable; that the expense of reclaiming it would in no case exceed, and, in general, would be considerably under L. 10 per acre; and that every acre, when so reclaimed, would produce to the owner a rent of 20s. per acre, or 10 per cent. upon the capital expended upon improvement, besides making an estate. He adds his personal conviction of the feasibility of such an immense improvement, in these striking terms: "Upon the whole, I am so perfectly convinced of the practicability of converting the whole of the bogs I have surveyed into arable land, and that at an expense which need hardly ever exceed the gross value of one year's crop produced from them, that I declare myself willing, for a reasonable consideration, to undertake the drainage of any given piece of considerable extent, and the formation of its roads, for the sum of one guinea per acre, which is little more than seven years' purchase of the rent it would then afford."

The Quarterly Review for July 1828, in discussing the evils

of Ireland, and their remedies, presses this topic most forcibly on the attention of the landed proprietors of Ireland. To those who allege that no profitable demand can be created for the labour of the neglected and unemployed population, the reviewer recommends an attentive perusal of the evidence before the House; and, instead of the much vaunted panacea of emigration, he recommends, that, in whatever district of the island the population has, from any cause, become redundant, the excess may be employed in reclaiming and cultivating the bogs and wastes of their native country, while any such bogs and wastes remain. "The benefit," he adds, "which the labourer himself would derive from such a measure, would be at least as great as any that could be expected from his deportation to the colonies, and the advantages which would accrue from it to the proprietors of the Irish soil would be incalculably greater; the unoccupied labourers, who now impoverish and weaken the community, would thus be rendered the source of wealth and strength; idleness would give place to industry, poverty and insubordination to abundance and tranquil contentment, and the productive powers of this highly fertile island would be gradually and fully developed; so ample are the resources which Ireland presents for the profitable employment of a rapidly increasing population, that ages must elapse before they are entirely exhausted; to do full justice to the natural resources of her soil merely (to say nothing at present of her fisheries, manufactures, &c.) would require a vast addition to her present population. The supposition that,—while one-third of the whole surface of that island, although capable of cultivation, is in a state of nature, and while, moreover, the land already occupied might, by the application of additional labour, be rendered incalculably more productive than it is at present,—the removal of any portion of the existing labourers would benefit the Irish landholders, is surely a wild delusion. That the owners and occupiers of this imperfectly cultivated soil, that the proprietors of these reclaimable, but uncultivated wastes, should conceive that any serious and permanent benefit could accrue to them from the removal of the only instruments by which their tillage might be improved, and their wastes rendered productive, appears to us all but incredible." * * * "It is a fact proved beyond the

possibility of being disputed or cavilled at, that a considerable proportion of the bogs of Ireland are capable of yielding a large remuneration for any conceivable capital which may be expended in reclaiming them. Are the landlords of Ireland all asleep? Or are they all expatriated? Can example make no impression upon them? Is it conceivable that they should continue to overlook so wide a field for the employment of their unoccupied countrymen, and so obvious and inexhaustible a source of wealth to themselves?"

With all this, however, it must be confessed, that the reclaiming of bog or mountain has rarely proved a profitable speculation to the individual who has embarked in it. Success, if attainable, can only be the result of patient perseverance, combined with practical knowledge, and not of ephemeral excitement, or crude speculation. Neither must too much be expected at once from the experiment, nor the efforts for its success be hastily abandoned. One can scarcely forbear a smile, on reading, in the minutes of the evidence before the House of Commons, of those unconscionable people who, to prove that reclaimed land soon returns to its original state, "took two crops of potatoes, and two of oats, from the new ground, sowed it with coarse grass-seed, mowed it till it no longer yielded meadow, and then complained that it was throwing money away to improve bog."

In order to carry on so tedious and difficult a process with effect, a wider field of operation, a larger number of subordinate agents, and consequently a greater expenditure of capital, are requisite, than can usually be devoted to the task by any single proprietor or occupier, especially in Ireland. The Society for the Improvement of Ireland has suggested, and various writers on Irish affairs, in periodical works, have frequently and pressingly urged on the attention of the British Legislature, the propriety of its interference to facilitate the cultivation of waste lands as a fit and most desirable substitute for emigration.

A Society in Ireland, as I am informed, has recently gone the farther length of recommending to the public a specific plan, which they propose to carry into effect by means of private subscription. This Society recently appointed a committee to inquire into the feasibility of colonising at home, adopting for

their model, it would seem, the poor colonies established during the last twelve years by The Benevolent Society of Holland. The committee appears to have confined itself to little more than an examination of the evidence before the House of Commons, on the subject of bogs and wastes in Ireland, parts of which are embodied in their Report, and the conclusions they arrive at are these :

Extract from the Report of the Committee.

“ It appears in evidence that there are, of reclaimable bog, in Ireland, two millions of Irish acres, of a soil suited to the production of grain. The mountain districts, at present comparatively unproductive, are capable of high improvement ; they consist of about one and a half millions of acres ; of which it appears that about one-half is suitable for agriculture, the remainder for much improved pasturage, for rearing or dairy purposes, and the entire eminently suitable for planting, much of the worst of it having been old forest land.

“ In Ireland there are few persons who, either in manufactures or agriculture, conduct their operations on such a scale as to admit of much surplus for accumulation of capital. The manufacture which flourishes—the linen—is spread abroad amongst a population which, at the same time, cultivates the soil for their subsistence ; and though such a manufacture may be more conducive to health and morals in the manufacturer, it is incompatible with large savings. In like manner, in agriculture, the tendency, from various causes, to subdivision of farms, and the general practice of throwing the expense of buildings and repairs on the tenant, countervail the accumulation of profit in the hands of the farmer, and the application of it to beneficial enterprise in agriculture. In considering the causes which discourage industry in Ireland, it is impossible to overlook the lamentable circumstance, almost peculiar to this country, of the non-residence of a great proportion of the proprietors ; and especially of that portion which could most contribute, by their rank, their wealth, and their moral influence, to operate beneficially on the habits and comforts of the lower classes.

“ The Reports of the Commissioners of Bogs, &c. suggest the subjects for agricultural exertions, and the mode of execution

and the small extent to which their recommendations have been acted upon, demonstrate lamentably that want of capital which in Ireland unnerves all effort for improvement.

* * * * * They submit that some public experiment should be tried that might demonstrate to the nation, either that the scheme of improving the bogs of Ireland is practicable or hopeless; and they express their opinion that nothing but such a plain and indisputable proof of the practicability and profit of reclaiming bog is wanting to turn the attention of individuals, and of large companies, to this mode of enhancing private fortunes and of increasing national wealth."

Accordingly, the Society resolved to advertise for subscriptions, and, as soon as furnished with sufficient funds, to take tracts of improvable bog wherever they can obtain them conveniently situated, with sufficient title, and on the most reasonable terms. These tracts they propose to divide, as I am led to understand by the communication of their secretary, into portions of 1000 Irish acres, and on each of these to locate 100 families. The first process of draining they estimate at an expense of 26s. per acre for bog, and 15s. for mountain. The expense of the primary settlement of each family in the colony they estimate as follows:—

Building a slated cottage,	-	L. 12 10 0
Furniture and implements of husbandry,	-	4 0 0
Clothes,	- - - -	3 0 0
Cow,	- - - -	4 10 0
Flax and wool,	- - - -	3 0 0
Rail-roads, at 10s. per acre,	- - - -	5 0 9
Ground, ten acres, at 20s. per acre,	- - - -	10 0 0
Sundries not included,	- - - -	3 0 0
		<hr/>
		L. 45 0 0

For four years they propose that no rent shall be paid by the colonists, but the society is to support them as farming labourers, and sell the crops for its own advantage. For the first year they propose that the crop shall be rape; and they estimate the outlay at L. 25 : 18 : 9, and the return for the crop at L. 18 : 18s. per acre: Second year, crop potatoes, outlay L. 7 : 10; income L. 20 per acre: Third year, crop oats, outlay L. 6 : 16 : 3; income L. 9 : 16s. per acre: Fourth year, crop

meadow, outlay L. 4 : 18 : 4 ; income L. 5 per acre. Which makes the outlay on the four years L. 44 : 18 : 4, and the income L. 58 : 14s. per acre ; this leaves a credit of L. 8 : 15 : 8d. per acre in the Society's favour, on the four years' proceedings, exclusive of the first expense ; and this they deem fully sufficient to meet partial failures, and every possible contingency. From the fourth year onward, they propose 6½d acres to be cultivated by each family for its own benefit, paying to the Society a rent of 15s. per acre, till the original expenditure of the Society is thus defrayed, which it will be, with interest, at the end of twelve years, or of sixteen years from the first settlement ; the rent to be then reduced to 7s. 6d. per acre. Besides this source of income, they propose the remaining 8½ acres of each decade to be cultivated for the use of the Society by each family, for which the Society is to pay them as farm labourers ; and from this they calculate a profit to the Society of 25s. per acre per annum, or L. 416 : 18 : 4 per annum from each colony, which, they presume, would defray all expenses of overseers, schoolhouses, premiums, and incidentals. From all which, they conclude, that, at the expiration of sixteen years from the commencement of each colony of 100 families on 1000 acres, the sum advanced on that colony would be repaid to the Society with interest ; and, also, that there would be a rental of L. 250 yearly from each to the funds of the Society, to enable them to plant new colonies, over and above the surplus of L. 416 : 18 : 4, applicable to the internal management of the colony itself.

Such is the plan, as I have been able to collect and abbreviate it from the documents hitherto, I believe, unpublished, which the Secretary of the Society has done me the honour of transmitting to me, in reply to my inquiries on the subject ; and though there are many items, both in the means and the end, in which I cannot coincide with what appear to me the somewhat crude and sanguine views of the Committee, yet, if the details be confided to the management of steady, able, honest and practical men, I am not without a confident hope of something really valuable being effected.

The efforts which have recently been so successfully directed to this important object in Flanders, naturally point to an ex-

amination of what has been done there. The London Society, for improving the condition of the lower order of tenantry, and of the labouring population of Ireland, has taken considerable pains to make the proceedings of the Benevolent Society of Holland known to the public, with a view to the adoption of similar proceedings in Ireland. The pamphlets of Mr Jacob, the comptroller of corn-returns, and W. Allen, the benevolent Quaker, on the subject, are printed and circulated by this Society. The number of persons supported under the Home Colonization System in Holland is stated to amount to nearly 20,000, and this great good has been mainly effected by the benevolent zeal and indefatigable exertion of one individual within a period of ten or eleven years. This individual is Major-General Van den Bosch. In the course of military service, he was quartered for a considerable time in the Island of Java, where he purchased an estate, and applied himself to the business of farming. It happened that a number of Chinese emigrants, under the superintendence of the mandarin Tjan-hoeck, an experienced agriculturist, settled near him. General Van den Bosch soon perceived, that, with all his care, the crops of his Chinese neighbours always far exceeded his own, and he was induced to enter into partnership with Tjan-hoeck, in order to become acquainted with his mode of cultivation, and avail himself of its advantages; by this means he so improved his estate as to be enabled to sell it for six times its original cost when he returned to Europe. The General has since published two works on the subject of Home Colonies; the first on the practicability of instituting, in the most advantageous manner, a general pauper establishment in the kingdom of the Netherlands, in which he explains the experiments and the processes tried and adopted by his Chinese friend in Java; and the second, in 1822, on the modes of proceeding introduced by him into the great colony of Frederika-Oord, which ought to be the handbuch or manual of all future founders of "colonies at home."—"The King of the Netherlands," says Mr Jacob, "was occupied, in 1817, with an extensive plan for bringing into productive cultivation an extensive district of waste between Maestricht and Breda. His attention was drawn to the communication of General Van den Bosch, and his patronage was

extended to the infant project. A public meeting was held at the Hague in the beginning of 1818, when the Society of Benevolence was formed. When the laws of the Society had received the sanction of the King, a public communication was made, and the governors of provinces, with the military and civil heads of departments, and other local authorities, were invited to aid the institution by becoming members of it, with the addition of all other benevolent persons who were disposed to do so. By these means more than 20,000 individuals were added to the Society, and subscriptions collected amounting to upwards of L. 5830 sterling. The Society, when satisfied that the funds at their disposal would be sufficient to warrant their proceeding with the experiment they had projected, purchased the estate of Westerbech Sloop, near the town of Steenwyk, on the confines of the three provinces of Friesland, Overysseel, and Drenthe. The estate contained somewhat more than 1200 English statute acres of heath-land, about one-sixth of which had been converted into fields, or was covered with bad wood. This estate cost L. 4660 sterling. A small stream, the Aa, which runs through it, was made navigable for boats; buildings for a store, a school, a spinning-house, and dwellings for fifty-two families, consisting of from six to eight individuals each, were speedily erected. The communes sent some indigent families to occupy the houses, who ceased from that time to be a burden on them. All these operations were commenced early in September 1818, and on the 10th of November following the colonists entered upon their new habitations. The following estimate of the expense of the outfit of each family was made before Frederiks-Oord was begun to be settled, and by a fundamental law of the Society, the estimate cannot be permitted in any case to be exceeded:—

Building each house,	L. 41	13	4
Furniture, and implements of husbandry,	8	6	8
Clothing,	12	10	0
Two cows, or one cow and ten sheep,	12	10	0
Putting the land into cultivation and seed, for the first year,	33	6	8
Advances in provisions for the first year,	4	3	4
Advances of other kinds,	4	3	4
Flax and wool to be spun,	16	13	4
Seven acres of uncultivated land,	8	6	8
Total expense of each family for the first year,	L. 141	13	4

As three families contain twenty individuals, two of them consisting of six persons each, mostly at maturity, and one of eight persons, six of whom are youths, from six years old upwards, the expense of outfit for each person amounts to L. 22, 6s. 7d., which is expected to be reimbursed to the society in sixteen years, by the rent to be received from the colonists, and by the labour they afford in its service ; whilst the annual rent with which they are charged will be equal to the interest. This rests upon the plain calculation that the annual value of the proceeds of the labour of six persons beyond the value of the produce on which they subsist, will amount to 30s. per year ; or, to carry it still further, that the produce of the labour of each of the individuals will exceed their subsistence about five shillings per year, or at the rate of less than one penny farthing per week.

The first principle of the society is, that no colonist shall ever be, even for the shortest period, unemployed. With this view, the population is divided and subdivided into bodies, who work under the inspection of different ranks of officers with military precision. A superior director, at first General Van den Bosch himself, superintended the whole establishment. A sub-director presides over one hundred families. These are again divided into twenty-four families, over whom a quarter master is appointed. This division is formed into two subdivisions, at the head of each of which is a section-master, a practical man, who is the example and the instructor of those under his command, in the necessary work which they are to perform. Thus the whole mechanism resembles that of an army divided into sections, companies, battalions and brigades. In fact, most of the sub-directors and quarter-masters are officers. Military men, when properly qualified, seem the best adapted to execute duties which require implicit obedience towards superiors, and firmness in the enforcement of attention and submission on those under their command. The colonists are summoned to rise at five in summer, and at six in winter, by a bell ; an hour is allowed for their domestic purposes, when, at the second bell, they must assemble before the door of the quarter-master, the roll is called over, and when they have answered to their names, they are led by the section-master to their various occupations. He who

does not answer to his name is entitled to no wages for that day, though every kind of labour is paid for by the piece only. After a few years' experience, it has been found that, on an average, the annual excess of produce over subsistence of each of the first fifty-two families established at Fredericks-Oord, has amounted to L. 8 : 2 : 4. When the society had proceeded with their plan a sufficient length of time to ascertain its stability, and were satisfied of the correctness of the calculations on which it was founded, they naturally wished to extend its influence. They therefore resolved to raise, by loans, to be repaid by instalments in sixteen years, sums equal to the outfit of as many families as should be established in the colony. As each family required L. 141 : 13 : 4 to settle it, and as three families, one of which consisted of six orphans or foundlings, could be advantageously classed into one group, the loans were limited to L. 425 Sterling. These might be advanced by individuals, by charitable corporations, by communes, or by the King, either in his individual character, or by the government of which he is the head. The individuals or bodies contributing this sum were to have the privilege of sending to the colony three families, two of them to consist of six paupers each, and the third of six orphans or foundlings, not under six years of age, with a man and woman, a married couple, if practicable, or, if not, a woman only, to manage for the children. For the maintenance of each child, the society is to be paid L. 5 yearly, which is to cover the whole expense, including their education and religious and moral instruction. School-houses are built, and regular masters provided. Churches are provided for the Catholics, Lutherans, and reformed communions; and a regular attendance on the services of the confession to which the colonists belong is strictly enforced on all of them. From the delicate circumstances in which the kingdom of the Netherlands is placed, owing to the religious difference between the two parts of which it is composed (and, in this particular, the resemblance of the state of *Ireland* is unfortunately but too complete), it has been deemed wise to keep education distinct from spiritual tuition, though both go on concurrently; and hence the school-books are all of a description which none can disapprove. The teachers, one of them from Hofwyl, have introduced the system of instruction

adopted by Fellenburg. According to the representations of the clergy, who complained bitterly of the utter ignorance of every religious feeling or idea among those who were first fixed in the colony, but especially among the young, the improvement, in this respect, has been so great as to be highly gratifying to their feelings.

The very interesting observations contained in Mr Jacob's pamphlet, at the head of this article, and extracted from his tracts on subjects relating to the corn laws and corn trade, present a variety of further details respecting the mode of cultivation, and especially of the means of providing and managing manure, and the scrupulous attention to every possible mode of increasing it practised by the society at Frederiks-Oord, as well as many other particulars of extreme importance to all future projectors of colonies on a similar plan. As, however, it is proposed to recur to this subject, should the Irish home colonies be proceeded with, and as the first steps must necessarily be confined to draining and preparation of the wastes, we may now proceed to notice the recent works which treat of this subject.

Monteath, the forester, evidently does not know much about the matter. His book, nominally devoted to the subject, contains in reality but a few pages upon it. He sets out with the very startling statement, that there are of waste lands in Scotland alone 14,218,224 acres, and in Ireland "triple that quantity;" that is to say, in Ireland, the whole extent of which is considerably under twenty millions of statute acres, there are 42,654,672 acres of bog and mountain.

It is recorded in deathless song, of St Patrick, the wonder-working apostle of the island of saints, that

He dhriv the frogs into the bogs,
And banished all the varmint.

and now that it is proposed to plant the moors with Protestants (and Papists too, I hope, if the thing be found possible and expedient), another northern Thaumaturgus (for Succoth Patricius was a Dumbartonshire boy), has luckily appeared to supply ample scope and verge enough, at an easy rate, for the additional accommodation required by the bipeds. Mr Monteath's new and easy system of draining and reclaiming the bogs and marshes of Ireland, is briefly this: "First, to plant with larch firs one-

third part of all such lands, and to crop the other two-thirds. The larch-firs are to serve three most important purposes ; first, to absorb by suction, and evaporate the water; second, to provide manure for the corn-lands" (by their falling leaves, it is presumed) ; " third, to shelter and warm the corn, or cropping lands ; and, fourth, for profit." This process alone, he affirms, will suffice, for " ten-twelfths" of all the bogs in the kingdom, and in the remainder it will only be necessary, in addition, to sink a pond of five acres to the hundred, four or five feet deep, to get rid of the heavy wet, and throw the stuff you excavate upon the corn-land. There is considerably too much of the currier chronicled in the Universal Spelling-book in this. Monteath is a planter ; therefore there is no more to do but plant the bogs and the trees will all flourish, even as trees planted by a river, and will pump up all the wet out of the marsh, and scatter it to the four winds of heaven. There are valuable practical observations on trees and planting all through this book, but it is written in an offensive, disagreeable manner. The author assassinates the King's English, and belabours Priscian's head with the most unheard of barbarity, which one could very well away with in a workman's booth, on the fair and general principle, that style or mode of expression is not to be criticised in writings,—

—— quorum non gloria nobis
Causa, sed utilitas officiumque fuit.

But when the man talks in an ultra-crepidarian manner of himself and his sayings and doings, and attempts to quote poetry, it is rather too bad.

Mr Lambert's is a work of very different stamp. He is a gentleman of property, residing in the county of Mayo, and he writes what seems intended as a manual for country gentlemen residing on and improving their estates and country mansions. It is a useful compilation of sound practical views on the subjects of farming, planting, and gardening, adapted to the soil and climate of Ireland.

Mr Lambert is not quite so sanguine on the subject of reclaiming bog as most of the Commissioners who reported on the subject to the House of Commons appear to have been. " Some

of the Commissioners," he observes, "value this reclaimed bog without distinction, so high as 30s. and 35s. per acre, and others, more reasonably, at 20s. Now, leaving advantageous circumstances with regard to situation, &c. out of the question, I am of opinion, notwithstanding the high and much more able authority of those gentlemen on the subject, that even the latter rent of 20s. is much too high an *average* value for such lands. The verges of bog, there is little doubt, might, in many instances, be made worth the latter rent of 20s., and will pay well for an outlay on its improvement; but if an arable *average* acre as to quality of *dry* land, can be had for 30s. a year of rent, or L. 30 in fee, at the high rate in Ireland of twenty years' purchase, or an acre of prime land for 40s., or L. 40 in fee; and even admitting the reclaimed bog worth 15s. rent, or L. 15 in fee, although 10s. would be nearer the average value, still the prime acre will be worth nearly three of the reclaimed one. But if bog could, for an outlay of L. 7 per acre, be made to produce a rent of 30s. as some of these estimates set forth, it would argue little for the understanding or enterprize of our proprietors, who have so long rejected such a source of wealth."

"When the prices of produce are low, it appears to me that tillage on bog or inferior arable land will not pay the different expenses attendant upon it, nor can it be expected that bog or moor will have the staple of dry arable land; and those writers who advocate tillage on bogs, would do well to advise pasture or meadow instead. *To the poor*, indeed, the tillage of such lands would not be so objectionable, for many reasons, each having his own small portion; and if due encouragement were held out, *and good faith maintained*, this would bring much land into cultivation. It must be recollected, that, in four cases out of five, the interior of bog will cost double the sum per acre to reclaim that the verge will, as it is not only farther from the clay or gravel, but the road is also soft for carriage; it is generally composed, too, of reddish or brown fibrous peat, which is not only more difficult of improvement than black bog, being less solid, but is also inferior for the purposes of fuel, or making manure, or composts for other lands. It will also be more difficult and expensive to drain. I should be glad, however, to see the matter undertaken (so far as the *drainage* at least) as a

national or public one, on large and extensive tracts, in preference to the encouragement of emigration. The land so drained would be gradually consolidating, and becoming every day more fit for further improvement and encroachment. The uncertainty, in many cases, as to boundary among bog proprietors, also calls for the interference of the legislature, as it frequently prevents many country gentlemen from undertaking works of the kind. But the principal obstacle is that of bogs frequently not being in the possession of those most interested in reclaiming them: as formerly, and even of late years, they were leased with the adjoining lands, in which case the tenant, even if he were inclined for improvement, probably has not sufficient length of tenure or interest in the land to excite him to reclaim.

“To reclaim a piece of land of this description, the first thing necessary is, to make a large deep drain to the substratum, between the deep wild bog and the verges or ridges, so as to catch all the water from the overhanging bog, which almost invariably rises or swells towards the centre, and thus effectually prevent the cold springs, which are frequently towards the summit, from injuring the verge. A river, lake or stream, generally lies contiguous to, or runs through, or by the side of a bog. This you must make the vent of your main drain, and see that you can secure sufficiently ample outlet to admit at all seasons of a free and uninterrupted passage for the water. It would also be desirable, when practicable, to throw down eel and small mill-weirs and dams, which in most instances do more damage than they are worth, by impeding the course of and backing the water. The beds of such streams should also be deepened and cleaned up in summer time, particularly when the water runs sluggishly; and, where it winds and meanders in its course, it should be straightened, as it will thereby become less liable to be choked. Where there is no stream, you must form an outlet in the lowest adjoining ground, and follow the vales or hollows formed by Nature, which she herself points out, and it is only necessary to assist her.

“The plan or line of main drain between the wild bog and the more reclaimable verges which I would recommend, would be semicircular, or somewhat in the form of a horse-shoe, or it may be angular in the direction it takes through the bog, or

form three sides of a square. Both the discharging points must end at the stream or river.

“ If the centre of the bog be intersected with small drains, the one here described will serve the purpose both of a main and catchwater drain. Bog may be drained too much, and made so dry as to become unproductive ; it will not therefore be necessary to sink any drain to the substratum but this. I do not think it necessary to state the depth this drain should be, as it must depend on the depth of the bog ; however, it will be right to advise that it should not be made all at once ; part now and part again will be found the most advantageous method, as the banks of the drain will be thus less likely to fall in. The banks should be slanted well, and it should be narrow at bottom ; two feet wide, or less, if the flow of water is not great will be sufficient, and from nine to twelve feet broad at top ; but the narrower at bottom, the more free it will be kept by the water from accumulating matter. Where improvements are carried on extensively, this drain, by keeping it full of water for a time, may be made navigable for small flat boats to carry gravel, lime, clay, &c. for manuring purposes.

“ The next proceeding should be to plant a belt of Scotch fir trees on the inside of the horse-shoe drain, for the purpose of forming a shelter in breaking the chilling winds, which have nothing to intercept them on bleak moor and bog lands, and which are a great check to vegetation. This belt will be found a most valuable shelter in course of time, and otherwise tend much to improvement, and the roots will in time strengthen the banks of the drain. This tree also is peculiarly adapted for the purpose beyond any other, as well from its being the best grower in bogs, as from being more effectual as a shelter in winter and spring, when most required, by the retention of its foliage. Some poplars may be mixed to prevent too much of sameness, and on the sheltered side a few spruce firs, to close the screen at bottom. A hedge of broom or gorse, on either side, will also tend to the same purpose, as well as to shelter the trees, and the roots will make firm the banks of the drain.”

Such are the principal thoughts of Mr Lambert on the best mode of draining and preparing the Irish bogs, epitomized and arranged so as to bring the subject before the readers of the

Agricultural Journal, as simply and clearly as may be. Whether these suggestions, or any of them, will be acted upon or not, is yet unknown ; but that much good might be done, if wise and patriotic exertion were directed towards applying the unemployed labour of the poor, to the judicious cultivation of unprofitable wastes, is quite certain. Any one who travels by the military road through the mountains, from Dublin to the romantic vale of Glendalough, in the county of Wicklow, will pass through a tract of heathy land, at present scarcely affording food or shelter to so much as a grouse or a rabbit, and of such amazing extent, and so favourably situated for improvement, as of itself to afford profitable employment to almost all the idle hands in Ireland. Mr George Moore, the able and excellent member for Dublin, has already converted a part of this wilderness into a valuable and beautiful estate. For the most part, however, it is said to be church land, and, therefore, the nature of the tenure scarcely admits of expensive or laborious improvement being made ; but this is an evil which the legislature could surely remedy, without infringing the integrity of church property. It is said that even at present bishops have a right to give a forty-one years' lease of *waste lands*.

Of all the pleasures derivable from external nature, none is perhaps more exquisite than to view planted enclosures, smiling pastures, and waving fields of golden grain, where one remembers to have seen only a barren heath or boggy swamp ; and to reflect that we ourselves have been mainly instrumental in effecting a transformation so delightful. That such a change may be produced in the dreary wastes of his native country, is the "earnest cry and prayer" of the present writer. But the difficulty is to find conducting men for any such attempt, who are able and zealous, and honest enough, to devote time and energy to the task, in singleness and simplicity of heart, from a sincere desire to please God, by doing good to man.

In Ireland, too, past experience proves it to be requisite to offer some sufficient security to the public, that especial care will be taken to crush every indication of a spirit of jobbing, or of trading on the bounty of those who may contribute to so good a work.

E. J.

ON THE LEASE.

(Continued from Volume I. page 809.)

THE rules of management we have seen to be dependent on the nature of the farm, and the species of cultivation to which it is suited; the period of entry, and the mutual obligations of outgoing and entering tenants, are more determined by local custom. Throughout the greater part of England, the period of entry is in May, the outgoing tenant reaping the waygoing crop of that year; and, in those parts of Scotland, where the principles of the lease are supposed to be the best understood, a similar mode of entry is in use. The entry is at Whitsunday, as regards the grass, the land in fallow, and farm-buildings; and at the removal of the crop of the same year, as regards the arable lands in crop. Wherever custom has established this species of entry, it should be preserved, since it presents certain conveniences, scarcely attainable under any other.

When land is of that nature to render necessary a summer fallow, it is important not only that the operation be not omitted in any one year, but that it be well performed. But, in the last year of a lease, the outgoing tenant does not reap any benefit from the summer fallow of that year; and, if bound by covenant to till it, he has not any interest in doing the work well. By removing at Whitsunday, however, this operation is performed by the new tenant, who alone is interested in the execution. At the same time, the new tenant is allowed to take possession of the farm-buildings, for which the old tenant has now no further occasion, his last crop being already prepared and sown. The new tenant, at the same time, takes possession of the grass land; which is of great importance to him, and no inconvenience to the old tenant, who can generally sell his live stock at this season of the year with as much advantage as at any other. Thus we see, that, after the last crop is sown, and no further tillage is required of the old tenant, the new tenant is allowed to take possession of the fallow-land and work it; of the houses, of which the former tenant has no further need, and

of the grass-land, from which the removal can be made without inconvenience.

Various stipulations, however, are necessary, where this period of entry is adopted, which are not required when the entry is in the latter part of the year. It is necessary to stipulate, that the entering tenant shall have power, even previously to the time of entering to regular possession, to give one ploughing, at least, to the land to be in fallow. This he may do, without any injury to the old tenant worth noticing, who, having reaped the crop of the preceding year, has no farther use for the land which is destined to be in fallow, while, to the entering tenant, the privilege is one of considerable importance. Experience shows that land intended to be in fallow should receive one ploughing before winter, so that, by being exposed to the weather, it may be rendered more friable and suitable for the summer tillage. The lease, therefore, should provide, that the entering tenant shall have power to enter to, and plough the land intended to be in fallow, at any period after the 15th of December, previous to the specified term of entry to the houses, grass-land and fallow. The old tenant will generally find it his interest to allow his own working cattle to be employed in this operation, at the ordinary rate of labour. It is further to be observed, that the new tenant gets possession of the fallow division, not only in time to till it for summer fallow, but also wholly, or partially, for turnips, should it be suited to that or any similar species of green crop.

Another peculiarity regarding a Whitsunday entry requires attention. The proper application of the manure produced on a tillage farm, is to the summer fallow, turnips, or such green crop as is preparatory to the white corn crop, and not directly to this crop itself. Applied to the latter it would be of little comparative advantage, and would tend more to multiply weeds, and increase the bulk of the straw, than the produce of the crop. But the old tenant, where the removal is at Whitsunday, has neither the fallow nor green crop of the last year; and this has led to the stipulation, that the whole dung, the produce of the last crop but one, shall be left entirely to the entering tenant. Very often the dung is handed over in this manner from tenant to tenant, without any charge or payment

whatever. In this case, it is technically said to be left in *steel-bow*, a word of which the etymology is uncertain. In other cases, it is handed over from one tenant to another, on the receiver paying a price for it. Strictly speaking, this price ought not to be understood as the market or selling price, for no tenant in Scotland can, under the common law of the country, carry off the dung produced upon the farm, and sell it. He is, in the present case, merely prevented from applying it in a particular way to his farm; and all, therefore, that he is justly entitled to, is the loss he sustains by being deprived of the power of so applying, or rather of so misapplying it. This used to be perfectly understood in Scotland; but latterly the practice has crept in of compelling the new tenant to pay the whole market price to the old tenant. It is easy to rectify this, by specifying, in the lease, the precise rate, per cubic yard, at which the dung is to be paid for. Whether the dung is paid for, or delivered over in steelbow, it is apparent that the stipulation is an important one, and ought never to be omitted where the Whitsunday entry exists. By means of this stipulation, the waste, by an injudicious application of a substance so valuable as farm-yard manure, is prevented; the new tenant is enabled to manure his turnip and fallow division in the ordinary course, and thus the regular management of the farm is never interrupted.

Although the Whitsunday entry is recommended by various considerations of practical convenience, yet an entry at the latter part of the year is more prevalent. The period of entry, in this case, is generally Martinmas, as regards the whole premises. Where the summer fallow may, without injury, be dispensed with, the inconveniences of this species of entry are not material. Instead of fallow in the last year, the old tenant has turnips, potatoes, or such green crop as may be suited to the soil, and to these he applies his farm-yard manure, instead of leaving it, as in the other case, to his successor, while his own interest is sufficient to induce him to cultivate these green crops in a proper manner. But, where the summer fallow is absolutely requisite, this period of entry is attended with considerable inconvenience. Sometimes the obligation of working the summer fallow is imposed upon the old tenant, he receiving value for the labour he expends; but it is evident that he has

no interest in doing the work in a proper manner. Wherever, therefore, a Martinmas entry, and the necessity of a summer fallow, exist together, it is better simply to reserve power to cultivate the fallow land of the last year, so that, if the old tenant will not do it in a proper manner, it may be done by hired labour, or otherwise.

Of the stipulations peculiar to the Martinmas entry, it is only necessary to advert to two; the others, indeed, may be considered as common to the Martinmas and the Whitsunday entry.

1st, As the tenant under the Martinmas entry may have turnips or other similar green crop in the last year, the proper time of consuming which is in winter, that is, subsequent to his regular removal from the premises, he ought to have the power reserved to him of consuming the produce of these crops upon the farm. He may be allowed until the 1st of February in the subsequent year, for this purpose; and, if it is inconvenient to consume the turnips where they grow with sheep, he ought to have a field, or more, allowed him, to which he may lead them to be consumed.

2d, The other circumstance to be adverted to is of less importance, but it should not be overlooked. We shall see that a power must, in all cases, be reserved to sow grass-seeds with the old tenant's waygoing crop. Where the old tenant removes at Whitsunday and the separation of the crop of that year, he has no material power of injuring the grass-seeds, after the last corn crop is reaped; but, when the removal is at Martinmas, the old tenant has an interval, from the period of harvest until his removal, in which, by over-pasturing, he may injure very materially the young grass plants. In all cases of the Martinmas entry, therefore, the old tenant should be prohibited from pasturing the land sown down with grass seeds in the last year.

It is always highly important to prevent the exhaustion of a farm, by the carrying off of straw or fodder. It is necessary, therefore, to stipulate, that all the straw produced shall be consumed upon the farm; or that, where local circumstances make the sale of straw part of the ordinary management, an equivalent, in the form of forage manure, shall be brought back to the farm. In many cases, the straw is delivered over from

the tenant in possession to his successor, in what we have already termed steelbow. Where this admirable system exists, the landlord has one of the best securities afforded him, that the lands will not be exhausted by carrying away the produce. It is to be regretted, however, that the system of steelbow-straw is only confined to a few districts ; and that, over the greater part of the country, the power is given of carrying away entirely the straw of the waygoing crop. Where the better system prevails, some peculiar stipulations are necessary, whether the entry be a Martinmas or Whitsunday one.

1st, The old tenant does not in this case sell his last crop upon the ground, but thrashes it out in a regular manner, delivering over the straw to his successor, as the grain is thrashed, and disposing of the grain itself as if he were still tenant of the farm. This requires that he shall continue to possess the barns and barn-yards, and have also such stable-room afforded him as is required for the horses employed in carrying his produce to market. He ought to have these privileges granted him until at least the Whitsunday following his regular removal. We shall point out the mode of providing for this in the formula of the Lease, to be afterwards given.

Whether the entry is at Whitsunday or Martinmas, it is necessary to reserve power to sow grass-seeds with the last or waygoing crop. It is not necessary, however, to reserve power to do this upon the whole farm, but only on such part of it as had been summer fallow, or manured green crop, in the preceding year ; because this is the only part of the white crop which is, generally speaking, suited for being sown off. In general, it is perfectly fair to stipulate that the old tenant shall harrow or roll in these seeds in a proper manner ; and if this was done to him, free of charge, when he took possession, he, of course, ought to do it free of charge to his successor. The expense of the mere labour is quite trivial, though it is frequently contended, and, no doubt, often with reason, that the white crop is somewhat injured by grass-seeds being sown with it. In all cases, claims of this kind should be fixed precisely at a specified rate per acre. Fifteen shillings per English acre is in general sufficient as an indemnification for loss sustained, and one shil-

ling per acre where the mere expense of labour is to be paid for.

An important stipulation in every lease, is that which relates to the keeping in repair of houses and fences. The burden of building, though a heavy one on landed property, must necessarily be borne by the owner, in order to allow him to obtain the full rent for his land, and to enable the lessee to cultivate it in a proper manner. It cannot be hoped that tenants in general will consent to erect the necessary buildings at their own expense on a lease of common length—and none, certainly, will do so without obtaining a full equivalent in a diminution of the rent. But this is not all the evil of laying upon them a burden disproportionate to their interest in the land. They have no interest in executing the work in a manner more substantial than is required for endurance during their own limited period of possession; and, besides, their time and capital are diverted from the proper objects. It is greatly to be regretted that the charge of erecting buildings is, in too many cases, thrown upon the tenant. Wherever such a practice exists on any estate, the sooner it can be abolished the better; for it is not too much to assert, that no landed property can be held to be in a satisfactory state where such a practice prevails. It is frequent, indeed, to stipulate, that the tenant shall lead forward the materials required. Even this is to divert his funds and attention from the cultivation of his farm; but the defence of this practice is, that the tenant can, at spare times, carry forward the materials of building at greatly less expense than can be done by contract.

The extent of building will depend on the nature and size of the farm; and the arrangement and dimensions of the several parts will also be affected by the same circumstances. Small farms require a greater proportional extent of building than large, and arable farms greatly more than pasture farms. Enough of building should be afforded for the real accommodation of the tenant; but neither the first cost, nor the expenses of a subsequent reparation, should be increased by buildings that are superfluous. As it is almost always expedient to build by contract, too much care cannot be bestowed in specifying the details of the work, the manner of execution,

and the nature of the materials. It need hardly be observed, that the best covering for the roofs is slate, and that the Swedish, Norway, and other northern timbers, are preferable to those of home-production.

The common stipulation, when the necessary buildings are erected, and in a proper state of repair, is, that the tenant accepts of them as in good and sufficient tenantable condition, and binds himself to keep them up and leave them in the like state at the termination of the lease. The words "good and sufficient tenantable condition," are doubtless somewhat vague; but it is sometimes difficult to substitute expressions more precise, and not always safe to deviate from those in common use. Under this stipulation, farm-buildings, originally good, may be delivered over for a very long period from tenant to tenant, each in his turn becoming bound to keep them up in the state in which he receives them. The waste of time, however, will prevail in the end; but the difference of the time necessary for entirely rebuilding, will vary so prodigiously with the original good or bad execution of the work, as to make attention to this subject a highly important one on every well regulated landed estate.

Of enclosures, too, the expense ought generally to be defrayed by the proprietor. For, besides the injury of diverting the time and capital of the lessee to other objects than the cultivation of the farm, it is of so much importance that the work be well executed at first, that the execution ought not to be devolved upon the lessee, whose interest is only temporary. It is perhaps superfluous to observe, that the value of land will scarcely ever fail to be increased by enclosing. Without it, cattle of different sorts cannot be divided, improved, or fed undisturbed. A due admixture of tillage and pasture cannot be resorted to, and often even mere tillage cannot be properly conducted, from the difficulty of defending the growing crops from trespass.

Fences should, as much as possible, be made straight lined, and be so situated as to favour the descent of water. Similar soils should, as far as practicable, be included in the same fields, and care should be taken to have water in every division. No precise dimensions can be fixed on as the best for enclosures. In general, the size should vary with that of the farm. When a country is totally under culture by the plough, it matters less

what extent the fields are ; but when there is a mixture of grass and tillage, the fields should be of moderate dimensions, perhaps from thirty to forty acres, even on the largest farms. Fences of stone are the most costly ; but then they become useful as soon as made ; whereas thorns require many years of care and protection. But thorns should be preferred, wherever soil and climate will permit them to be reared. Such fences afford shelter, assist the drainage, and add to the beauty and value of estates.

The stipulation regarding the keeping up of fences, is generally similar to that for farm-buildings. The tenant accepts of them as in good and sufficient tenantable condition and repair, and binds himself to leave them in the like state at the termination of his lease ; and he should also be bound distinctly to keep the ditches and drains clear. Too much vigilance cannot be bestowed in enforcing these obligations ; for thorn-fences, when once ruined by neglect, can scarcely be restored. The state of thorn-fences throughout the greater part of Scotland is altogether disgraceful. They are generally suffered to fall into ruin nearly as soon as made ; and, consequently, thus fail in adding to the value of estates, or serving the purposes for which they were intended. The persons who thus neglect and ruin the fences entrusted to their charge, would do well to look at the diligence which English farmers exhibit in executing this part of their duty, although the lines of fences are generally, from the smallness of the enclosures, four times more extensive. Formerly, in Scotland, the usual practice was for the landlords to bear one-half of the expense ; and still this is sometimes practised, where the difficulty of rearing and preserving these plants is considerable, or where gentlemen are desirous of a more liberal expenditure upon them than tenants are generally willing to incur.

The next point to which we request attention, is the kind of Rent payable, and the terms of payment.

Rents, in Scotland, are paid either previous to the first crop being reaped, when they are called *fore-rents*, or they are paid subsequent to the reaping of the first crop, when they are termed *back-rents*. In England, it is believed that, with a few exceptions in the Border counties, back-rents are not in use. The

effect of these rents is, to afford a long credit to the tenant. It is assumed that his means of paying any year's rent are chiefly derived from the sale of the crop of that year, and hence he is allowed to reap and sell the crop, in order to pay the rent. Thus, if he enters at Whitsunday 1829, and separation of crop 1829 from the ground, his first year's crop is that of 1830; and his first year's payment is usually made at Martinmas 1830, and Whitsunday 1831. Were he to pay what is termed fore-rent, his first term's payment would be at Martinmas 1829, and his second at Whitsunday 1830, thus completing his first year's rent before his first crop had been reaped.

Wherever custom has established the system of back-rents, it should not be disturbed. By means of the credit afforded, tenants are enabled to take land with a smaller capital, and to expend those funds in the improvement of the farm, of which they must otherwise have been deprived. It must be thus attended with one or other of two advantages to the landlord; first, by bringing farms more within the reach of the funds of takers, it excites greater competition; or, second, it leaves a fund in hand to the lessee, for the immediate cultivation of his land. In Scotland, this system is attended with no hazard; since landlords have always, in that country, a security, by means of their legal rights of hypothec on the crop of the tenant. In the case of farms merely pastoral, indeed, the landlord's claims will not be well secured, because a tenant removing at Whitsunday will have left no crop behind to answer for the rent. In farms of this nature, accordingly, rents are stipulated to be paid in advance.

As to the kind of rent to be paid, constant experience proves that the best and most satisfactory is a fixed rent in money. To rents payable in grain, or in money regulated by the prices of grain, there is this obvious objection, that the tenant will generally be required to pay the highest rent when he is least able to do so, that is, when prices rise high from a deficiency in the produce of the crop. In this case, if a tenant has not a good capital to support him, he may, in a single year, be ruined past recovery. It thus becomes necessary, for the tenant's security, to fix a maximum beyond which the rent shall not rise. But if it be necessary, for the tenant's security, to fix a maximum be-

yond which the rent shall not be suffered to rise, it is obviously equally necessary for the landlord's security, to fix a minimum below which the rent shall not be suffered to fall. In every transaction of this nature, therefore, there are two points to be determined,—a maximum of rent and a minimum, and surely there is just as much difficulty and chance of error in fixing these two points as extremes, as in fixing one point as a medium, or, in other words, as in fixing a determined rent in money.

With regard to payments in kind, it is scarcely necessary to observe, that these ought to be entirely exploded. They are the remains of a species of relation between landlord and tenant, which happily no longer exists in this country. In Scotland, they are chiefly confined to payment of fowls, and other articles of domestic consumption. The effect is to make the tenant pay a portion of his rent indirectly, and in a way only calculated to excite discontent; while nothing is gained to the landlord, who will generally command in the common market at a cheaper rate those articles of luxury or use he may require. There is another burden sometimes imposed, not less absurd, and more mischievous. This is what is termed *thirlage*, or the causing the tenant to carry all the corn he and his servants consume to a certain mill, the property of the landlord. The effect may be, to raise a little the rent of the favoured mill, but the tendency is at least equally obvious and direct to depress the rent of the lands subject to the burden. A proprietor, therefore, gains nothing who endows any mill with a right to thirlage. The right, indeed, may belong to the mill of another estate; but the law in this case gives a power of commuting the burden, which should, in all cases, be resorted to.

These, with the preliminary remarks in our former Number, will suffice, we trust, to explain the formula which we are about to give of the Lease. We shall adopt, in this formula, the Scottish forms of expression, and accompany each clause with such further remarks as may tend to render the subject distinct.

ARTICLE I.

“ It is contracted, agreed, and ended, between A. B. heritable proprietor of the lands and premises after mentioned, on the one part, and C. D. on the other part, in manner following: that is to say, the said A. B., in consideration of the tack-duty and other conditions after mentioned, hereby sets, and in tack and assedation lets, to the said C. D., and his heirs, but excluding assignees and subtenants, legal and voluntary, all and whole the farm of —, with the houses and pertinents thereof, as now possessed by E. F., lying in the parish of —, and county of —, and that for the space of nineteen years and crops from and after the entry of the said C. D., which is hereby declared to be to the houses, grass and fallow-land, on the 15th day of May in the year 1829; to the arable land in crop at the separation of the crop of the same year from the ground, and to the barns and barn-yards at Whitsunday 1830; from these periods respectively, to be possessed by the said C. D. and his foresaids, during the period above written.”

Where the entry is at Martinmas, the words of the lease may be—“ for the space of nineteen years from and after the entry of the said C. D., which is hereby declared to be to the whole premises, except the barns and barn-yards, on the 11th day of November in the year 1829, and to the barns and barn-yards at Whitsunday 1830.”

The condition excluding assignees and subtenants is universal in the leases in Scotland, and arises, it may be presumed, from the natural desire of landlords to have the choice of their own tenants. The precaution, indeed, does not secure to the landlord this object; for, during the currency of a long lease, the farm may pass into the hands of distant heirs, of whom the landlord can know nothing, or into the hands of tutors, or other legal managers, unknown to him, or to the husbands of female heirs. Besides, there is this evil in the stipulation itself, that, on the death of the tenant, the tenure of the lease must descend to his heir-at-law; nor has he power to select the member even of his own family who shall succeed him in the lease. This

preventing of the tenant from choosing the heir who shall succeed to him in his profession, may be the means of forcing the management of a difficult business on the individual of his family the least qualified for the duty ; for the heir of a tenant may be unfit for the management of a farm, or the family of a farmer may at his death be infants or females, incapable of business. These and other circumstances have induced many to censure very strongly the whole condition, and to propose that a lease should be the absolute property of the tenant, to be assigned or disposed of by him as he shall think fit. It may be fairly doubted, however, if many proprietors of land would be disposed thus far to concede their right of control (imperfect though it may be) in the choice of the person who is to occupy their property.

In practice, the system, as it exists, is attended with few real evils ; and all these may be removed by the landlord, if he merely consult his own interest. It never can be the interest of a landlord to refuse a tenant in possession power to sublet. If the tenant, and his heirs, are still bound, in the case of alienating, to pay the rent, and fulfil the other conditions of the lease, the security of the landlord is greatly increased by the guarantee of another, added to that of the original lessee, for the proper payment of the rent, and management of the farm. The subtenant brings with him a fresh capital, and generally begins a new system of operations when those of the old tenant had ceased or become languid. There is scarcely a supposable case, then, in which a landlord can have any inducement to refuse power to sublet, provided the subtenant is not, from any cause, objectionable. With regard to giving a power to the tenant to bequeath the lease to the individual of his family the best qualified for the management of the farm, no landlord of common sense could think of opposing it. The old condition of the leases, therefore, excluding assignees and subtenants, may be suffered to remain ; for greatly less practical inconvenience will be found to result from it, than some appear to imagine. As a set-off against this inconvenience, we may place the advantage which arises from the

oldest son of a family being regarded as the heir of the lease, and brought up, accordingly, to farming as a profession, from his childhood.

Custom and expediency have very generally fixed the duration of the lease at nineteen or twenty-one years. In cases where unusually great and costly improvements are to be made by the tenant, it may sometimes be expedient to extend the lease beyond the ordinary period ; but, generally, nineteen or twenty-one years will avail for all common improvements, and for the tenant's security. We must remember that, however favourable for the interest of one party it is that the lease should be long, it manifestly is not always, in a like degree, favourable to the other party that it should be prolonged. The value of a property, when it is to be sold, may suffer grievously from an unnecessary extension of the lease ; and instances are many, where the successors of landed gentlemen have been injured irreparably in their fortune, by injudicious alienations of this nature. Neither can leases for lives be approved of. They do not, in truth, afford to the tenant the same security for the return of expended capital, as the lease for a definite period. They often render the possessor careless and slothful, and generally detract, in the case of sale, from the value of estates.

ART. II.

§ 1.—“ Reserving from this set all metals, coal, limestone, freestone, and other minerals or fossils, with power to the said A. B., and his successors, or to those whom he or they may appoint, to search for, work, and carry away the said minerals and fossils, and to do every thing necessary for those purposes, by sinking pits, making roads, erecting buildings, and the like ; the said C. D., and his foresaids, being paid such damages as shall be done to the lands thereby, as the same shall be fixed and awarded by two neutral persons, mutually chosen by the parties, with power to the arbiters, thus chosen, to appoint an umpire or oversman, whose determination shall be final in the specific matter submitted to him.

§ 2.—“ Reserving also to the said A. B., and his foresaids, all plantations, woods and trees whatsoever, now, or that hereafter may be on the said lands, with liberty to prune, cut, and carry away the same, and to plant trees, in hedge-rows, all without any allowance to the tenant; and reserving also power, at all times, to take off land from any part or parts of the said farm, for the purpose of planting to the extent of acres; the said C. D., and his foresaids, receiving for the land so resumed a fair abatement from the rent, as the same shall be estimated by arbiters, chosen as aforesaid; it being declared that the said A. B., and his foresaids, shall enclose sufficiently all such newly planted land, and shall thereafter maintain, at their own expenses, such part of the fences thereof, as did not before form a part of the fences of the farm.

§ 3.—“ Reserving also all fish and game on the said premises, with free liberty to the said A. B., and his foresaids, or to those whom he or they may appoint, to hunt, course, fish and fowl upon the said lands.”

The following reservation may, in some cases, be necessary:—“ Reserving also to the said A. B., and his foresaids, full power to make or alter roads through the farm, and to straighten marches with the neighbouring proprietors or tenants, the said C. D., and his foresaids, receiving a fair allowance for any damages done to the farm thereby, as the same shall be ascertained by arbiters, chosen as aforesaid; but, in case the said C. D., or his foresaids, shall receive any benefit or addition, by such exchange, they shall pay annually to the landlord, such an equivalent rent as shall, in like manner, be fixed by arbiters, chosen as aforesaid.”

The terms of these several reservations are conceived to be fully adequate to the object in view, and to guard, to a landlord, in any lease, the rights of property generally understood to be reserved. The multiplying of such reservations, and descending to too minute specialties, are rather calculated to excite irritation, than to protect the landlord's real interests.

ART. III.

“ Which tack, with and under the reservations and conditions before and after mentioned, the said A. B. binds and obliges himself, his heirs and successors, to warrant to the said C. D., and his foresaids, at all hands, and against all deadly.”

This clause is a form general in deeds of this nature.

ART. IV.

“ For which causes, and on the other part, the said C. D. binds and obliges himself, his heirs, executors and successors, to pay to the said A. B., and his heirs, executors, or assignees, the sum of L. 500 Sterling yearly, in name of rent or tack-duty, and that at two terms in the year, Whitsunday and Martinmas, by equal portions, beginning the first term's payment of L. 250 Sterling, on the 11th day of November 1830, and the second term's payment, of the like sum, on the 15th day of May 1831 ; and that for the first year's possession of houses, grass, and fallow-land, and for corn crop 1830, and so forth, yearly and termly thereafter, with a fifth part more of each term's rent of liquidate penalty, in case of failure, with the legal interest of the same, during the non-payment thereof ; it being declared that, in case the said C. D., or his foresaids, shall allow two terms rent to run into a third unpaid, then this lease shall, in the option of the proprietor, become void and null ; and it shall not be competent to the said C. D., or his foresaids, to purge the irritancy by payment of the rents due, or otherwise, after an action at law shall have been brought against them.”

Where the entry is at Martinmas, as at Martinmas 1829, and the rent back-rent, the first term's payment will generally be payable at Martinmas 1830 ; and the words of the lease may be :—“ Making the first term's payment of L. 250 Sterling, on the 11th day of November 1830, and the second term's payment, of the like sum, on the 15th day of May 1831, and that for the first year's possession of the premises from Martinmas 1829, to Martinmas 1830.”

ART. V.

“ And, with regard to the farm-houses and buildings upon the said farm, seeing that E. F., the outgoing tenant of these lands, is bound, by the stipulations of the lease thereof, to leave the whole farm-houses and buildings in good and sufficient tenantable condition and repair, the said C. D. accepts of the said houses and buildings, as they shall be left by the said E. F., to be held as in good and sufficient tenantable condition and repair; and he binds and obliges himself, and his foreshaids, to maintain the same in the like state yearly, at their own expenses, and to leave them so at the termination of this lease; it being declared that the said C. D., and his foreshaids, shall be liable for any damage done to the said buildings by fire; and, for the greater security thereof, shall keep them constantly insured in some respectable insurance office, to the amount of not less than L. 1000, and shall produce, when required, yearly receipts for the premium of insurance paid. And, in like manner, the said C. D. accepts of the whole fences upon the said farm, whether surrounding plantations, or otherwise, with the gates and gate-pillars thereof, as in good and sufficient tenantable condition and repair; and binds and obliges himself, and his foreshaids, to maintain the same in the like state yearly, and to leave them so at the termination of this lease; and, in particular, to keep the whole ditches and water-courses clear and level free at all times.”

These stipulations, however, vary with the circumstances of the case, as with the conditions incumbent upon the tenant in possession, or with the stipulations come under by the landlord, for the building of new, or the reparation of old houses, the making of enclosures, and the like.

Sometimes it is thought expedient to assign over to the incoming tenant the obligations incumbent on the tenant in possession, with regard to the keeping up of houses and fences, thus :—“ And, in regard that the said E. F., the present tenant of these lands, is bound by his lease to keep up the whole houses and fences thereof in good and sufficient tenantable condition and repair, the said A. B.

hereby assigns and makes over to the said C. D., and his foressaids, all title or claim which he, the said A. B., may have against the said E. F., or his foressaids, for performance of the stipulations of the lease, in so far as regards the keeping up of the houses and fences, as aforesaid, granting full power and authority to the said C. D. to pursue for implement thereof, and to receive money and grant discharges thereof, in the same way as he, the said A. B., could himself have done. In consideration whereof, the said C. D. accepts," &c.

Assignations of this nature, however, cannot generally be approved of, since the effect is to drive tenants to a court of law for what may be better settled in the common way, by arbitration.

Sometimes the landlord reserves power to put the houses and fences into repair in case of the tenant's neglect. The introduction of this condition, however, cannot be commended, the natural result of an attempt to enforce it being ill-will and litigation, and the common law of the country being sufficient to afford protection to the landlord, in case of a breach of covenant by the tenant.

ART. VI.

" And with regard to the management of the said farm, the lands shall be cultivated, in all respects, agreeably to the rules of good husbandry ; and, without prejudice to this general obligation, not less than one-fourth part of the arable land shall be in any year in sown grass, and of the remainder of the said arable land, which the tenant is hereby allowed to plough or keep in tillage, not less than one-third part shall be in summer fallow, turnips, or potatoes, well manured in proper season, and no two crops of white corn shall succeed each other without a summer fallow, or green crop, intervening ; and no land shall be cut for hay above once after being sown off ; and all land laid to grass shall be sown with not less than ten pounds of red and white clover, and one bushel of perennial rye-grass seeds to the acre, and that with the first crop after summer fallow or green crop, manured as aforesaid ; and in the last year of this lease,

the landlord, or entering tenant shall have power to sow grass-seeds with the said C. D.'s way-going crop, on that part of the lands which had been summer fallow, turnips, or potatoes, in the preceding year, the said C. D. harrowing or rolling in the same, in a proper manner, without charge : and, moreover, in the last year of the lease, the said C. D., or his foressaids, shall, without any claim or compensation, leave to the landlord, or entering tenant, land for fallow equal to one-third part of the whole land which shall be in tillage in that year ; which fallow-land, the landlord, or entering tenant, shall have power to enter to, and plough, any time after the 15th day of December preceding the said C. D.'s removal from the pasture-lands, as aforesaid ; and the said C. D., and his foressaids, shall consume upon the lands the whole straw and chaff produced yearly thereon, for manure to the same, and they shall, without any claim or compensation, leave the whole straw of the last crop in steelbow upon the farm, together with all the dung made from the crop of the preceding year, properly put together ; and the said C. D., and his foressaids, shall, for the purpose of thrashing and carrying the last crop to market, have stable-room allowed them for six pair of horses, with the straw required for fodder and litter, without any charge, and that until the term of Whitsunday after the removal from the arable lands, as aforesaid."

These conditions are on the supposition of the entry being at Whitsunday. They must be varied, however, with many circumstances, as the nature of the farm, the management to which it is suited, and the conditions of the preceding lease as regards cultivation, and claims of the out-going tenant for straw, dung, and the like. When the entry is at Martinmas, there is rarely need, as has been adverted to, of an obligation on the old tenant to leave fallow, or a year's dung. In this case, as has been observed, he prepares his land, and manures it for turnips or potatoes, the lease allowing him until the first of February or other specified period in the spring of the year following his removal, for the purpose of consuming his turnips upon the ground.

Sometimes circumstances make it necessary to insert more special prohibitions ; as,

1st, A prohibition from ploughing up certain grass fields, which from any cause it is wished to retain in old turf.

2^d, A prohibition from cultivating plants that are supposed to be injurious, as flax, hemp, &c.

3^d, A prohibition from paring and burning, or from ploughing up such parts of upland farms as are more valuable as a resource to the stock than they could be in tillage ; and,

4th, A strict limitation on pastoral farms of the quantity of land to be broken up for tillage.

The last, and only remaining clause, is one of mere legal form, containing an obligation on the tenant to remove at the expiration of his lease.

To those who have had experience of the numerous errors committed in the drawing up of leases, the details we have now given will not perhaps appear unimportant or trivial. In every part of the country landed property is injured, and the contracting parties are involved in useless disputes, by the ignorance of those who attempt to draw up leases of land. Sometimes the errors of former leases are merely copied from one lease into another ; and, in other cases, attempts at improvement end in rendering the whole deed perplexed, contradictory, and the fruitful spring of litigation. The greatest error of this last kind of leases consists in vain precautions and attempts to provide against every possible contingency ; which, from the nature of the transaction, and the unforeseen events to which it may give rise, it is impossible to do. All that can be done, is to make as precise as possible the conditions which experience shows to be necessary. The terms of the contract should be few and simple, and easily understood and complied with. Not only are hurtful covenants to be avoided, but such as are unnecessary, since, to increase the number of them too much, serves but to perplex the lessee, and give birth to future quarrels ; and, since all experience on the subject shows that the interests of either party may be sufficiently guarded without multiplying too greatly conditions, penalties and restrictions.

MISCELLANEOUS NOTICES.

1.—*On the Sociability of Brutes.*—There is a wonderful spirit of sociability in the brute creation, independent of sexual attachment; the congregating of gregarious birds in the winter is a remarkable instance. Many horses, though quiet with company, will not stay one minute in a field by themselves; the strongest fences cannot restrain them. My neighbour's horse will not only not stay by himself abroad, but he will not bear to be left alone in a stranger's stable, without discovering the utmost impatience, and endeavouring to break the rack and manger with his fore-feet. He has been known to leap out at a stable-window, through which dung was thrown, after company, and yet, in other respects, is remarkably quiet. Oxen and cows will not fatten by themselves; but will neglect the finest pasture that is not recommended by society. It would be needless to instance sheep, which constantly flock together. But this propensity seems not to be confined to animals of the same species, for we know a doe, still alive, that was brought up from a little fawn with a dairy of cows; with them it goes a-field, and with them it returns to the yard. The dogs of the house take no notice of this deer, being used to her; but, if strange dogs come by, a chase ensues; while the master smiles to see his favourite securely leading her pursuers over hedge, or gate, or stile, till she returns to the cows, who, with fierce lowings, and menacing horns, drive the assailants quite out of the pasture. Even great disparity of kind and size does not always prevent social advances and mutual fellowship. For a very intelligent and observant person has assured me, that in the former part of his life, keeping but one horse, he happened also on a time to have but one solitary hen. These two incongruous animals spent much of their time together in a lonely orchard, where they saw no creature but each other. By degrees an apparent regard began to take place between these two sequestered individuals. The fowl would approach the quadruped with notes of complacency, rubbing herself gently against his legs; while the horse would look down with satisfaction, and move with the greatest caution and circumspection, lest he should trample on his diminutive companion. Thus, by mutual good offices, each seemed to console the vacant hours of the other.—*White's Natural History of Selborne.*

2.—*On the Effects of Earth-worms on the Soil, in promoting Vegetation.*—Lands that are subject to frequent inundations are always poor; and probably the reason may be, because the worms are drowned. The most insignificant insects and reptiles are of much more consequence, and have much more influence in the economy of Nature, than the incurious are aware of; and are mighty in their effect; from their minuteness, which renders them less an object of attention, and from their numbers and fecundity, earth-worms, though in appearance a small and despicable link in the chain of Nature, yet, if lost, would make a lamentable chasm. For to say nothing of half the birds, and some quadrupeds, which are almost entirely supported by them,

worms seem to be great promoters of vegetation, which would proceed but lamely without them, by boring, perforating, and loosening the soil, and rendering it pervious to rains and the fibres of plants, by drawing straws and stalks of leaves and twigs into it; and, most of all, by throwing up such infinite numbers of lumps of earth, called worm-casts, which being their excrement, is a fine manure for grain and grass. Worms probably provide new soil for hills and slopes, where the rain washes the earth away; and they affect slopes, probably to avoid being flooded. Gardeners and farmers express their detestation of worms; the former, because they render their walks unsightly, and make them much work; and the latter, because, as they think, worms eat their green corn. But these men would find that the earth without worms would soon become cold, hard-bound, and void of fermentation, and consequently sterile; and besides, in favour of worms, it should be hinted that green corn, plants and flowers, are not so much injured by them as by many species of *coleoptera* (scarabs) and tipulæ (long-legs), in their larva or grub state; and by unnoticed myriads of small shell-less snails, called slugs, which silently and imperceptibly make amazing havoc in the field and garden. A good monography of worms would afford much entertainment and information at the same time, and would open a large and new field in Natural History. Worms work most in the spring, are out every mild night in the winter, as any person may be convinced that will take the pains to examine his grass-plots with a candle; are hermaphrodites, and much addicted to venery, and consequently very prolific.—*White's Natural History of Selborne.*

3. *Pasturages, their importance, and their extent in different countries.*—M. Moreau de Jonnés lately read to the Academie des Sciences, a memoir, entitled, *Statistical Inquiries respecting the nature and extent of Pasturages in the different parts of Europe.* The author first exposed the defects of the systems in which the subsistence of nations is left dependent upon the uncertain chances of the grain crops. The frequent famines from which all the countries of Europe have, for a great number of ages, suffered, attest the unavoidable danger arising from these systems. A new system of agriculture has been introduced within a century, and gradually improved among different nations, especially in England, where it has produced the happiest results. Not only has the proportion of land devoted to pasturages been greatly increased, but this land has been rendered incomparably more fertile of vegetables adapted for the food of cattle. The influence of this happy modification appears to have been immense. To form an estimate of its extent and power, M. Moreau de Jonnés, passing in review the different nations of Europe, showed that the agricultural and commercial prosperity of the inhabitants is every where proportionate to the extent of the land left under pasture, whether in improved natural meadows, or in artificial meadows. England holds the first rank among the European nations in both these respects, and the lowest is Spain, where the cultivation of artificial meadows is entirely unknown. The author particularly compared England and France. There results, from important documents, that the latter country is a century behind the former, and that, to equal the English, the French will have to go through the immense improvements which have, in

that period, more than doubled their agricultural prosperity and general wellbeing. England not only surpasses France in respect to the number of cattle, but the animals there are much finer, and their flesh is of better quality; so that the inhabitant of England may, on an average, use for his food a quantity of animal substance nearly the double of what France furnishes to each of her inhabitants, and this quantity is moreover of superior quality. From the numerous facts adduced by M. Moreau de Jonnés, in his memoir, he drew the following conclusions: 1st, That pasturages, which are necessary for the existence of cattle, are one of the essential elements of the wellbeing of man, of the agricultural and commercial riches of state, and of the civilization of nations; 2dly, That they become eminently productive only after the assiduous and persevering cares of human industry, and that they abound in species capable of affording nourishment to cattle only after their conversion into artificial pastures, or after the destruction of useless or pernicious plants, which, in every country, overrun the natural pasturages; 3dly, That, in defect of the employment of these means of prosperity, there is a loss of three-fourths in the development and fattening of pasturing animals, and that then, as in the provinces of France, the mean quality of meat furnished for consumption by a hectare of pasturage does not exceed 98 lb., in place of rising to 400; 4thly, That, on the contrary, by the use of these means, there are obtained 300 lb. of animal food from a hectare of improved natural meadows, and 400 lb. from the same surface in artificial meadows; that, estimating only at the rate of 30 centimes the lb. of meat, and the products of cattle and sheep, leather, wool, butter, milk and cheese, the produce of the hectare is 49 francs when in unreclaimed pasture, 150 francs when in improved pasture, and 200 francs when in artificial meadows; 5thly, That consequently the 5,775,000 hectares, at present left in France to pasturing animals, produce only a revenue of 282,000,000 francs, whereas if they were converted into improved meadows, they would yield 863,000,000 francs, and into artificial meadows, a third more; 7thly, That such an increase of riches, rendered attainable by care being bestowed upon the pasturages, raises to the highest rank of economical and agricultural improvement those from which so important results might be expected; 8thly, That the improvement of pasturages, which is the necessary condition of that increase of prosperity, requires a thorough investigation of the geographical distribution of pasture plants, and careful researches for discovering by what secret operations nature peoples the pasture grounds with useful or noxious plants, and by what means the multiplication of the former may be favoured, and the spreading of the latter prevented. With this twofold object, the author announced that he had made researches, by means of experiment and observation, tending to the solution of the following questions: 1st, What are the local causes of the difference of pasture plants in the different natural meadows of the same country? 2dly, What are the original causes of this complicated phenomenon? 3dly, What are the means of improving and enriching the indigenous flora of pasture grounds?—*Le Globe*.

4. *On the application of Vinegar to Cattle inflated by an excess of green food.*—It is found that the gastric tympany, or the inflation which sometimes takes

place in the stomachs of horses, cows, or sheep, in consequence of an excess of green food, and of the gas thereby produced, and which cannot escape, may be frequently relieved by vinegar, which puts an end to the production of gas.

5. *On the Planting of Potatoes by Germs.*—M. Grebel, a clergyman of Ringleben near Erfurt, made a trial of this kind in 1826. Notwithstanding the great drought, the produce greatly exceeded his expectation, each plant having furnished from three to four pounds of potatoes, and some of the potatoes weighed nearly a pound. He remarks that, according to his experience, the early potato, called *Herrkarkoffel* by Putzache, is the best adapted for this mode of cultivation. A single germ sometimes produces from six to seven pounds of potatoes.—*Allgem. Anzeiger*. 1827.

6. *On the application of Pyrolignous Acid to the Preservation of Animal Substances.*—The substances to be preserved, beef, mutton, &c., are first salted in the ordinary way, after which they are well cleaned with a cloth, and exposed to the air. In this state, a single layer of pyrolignous acid concentrated to the strength of common vinegar, is passed over them. They are then hung up in a well ventilated place and in the shade, where the temperature is not too high. This method, which is founded on the nature of pyrolignous acid, one of the constituents of smoke, has been practised in France by several persons; but although less expensive than that commonly employed for smoking meat, it communicates to them a styptic and disagreeable taste, which it is difficult to remove.—*Bull. des Sc. Agricoles*.

7. *On the formation of Downs, and Turf Bogs.*—The effects of the sea, without the co-operation of inland rivers, are less productive. When the coast is flat and the bottom is sandy, the waves drive the sand towards the shore; at each ebb a portion is left dry, and the wind, which generally blows from the sea, casts it higher on the beach. Thus the *downs* are formed, those sandy hills which, if the invention of man does not teach him how to fix by introducing herbage suited to the soil, progress slowly, but with certainty, towards the interior of the country, and then overwhelm fields and dwellings; because the same winds which convey the sand of the beach on to the *down*, cast that of the summit of the *down* still farther inland. Wherever the industry of man has failed in confining them, these downs advance inland as irresistibly as the alluvial deposits of rivers advance towards the sea; they drive before them pools formed by the rain water of the lands in their vicinity, whose progress towards the sea they intercept, and their advance in many places is made with alarming rapidity. Forests, buildings, and cultivated fields are overwhelmed by them. The *turf-bogs*, so generally produced in the north of Europe, are the accumulation of the remains of sphagnum, and other aquatic mosses. They increase in proportion determined with regard to each place; they thus envelope the small mounds of earth on which they are formed. Many of these mounds have been covered within the memory of man. In other places, the turf-bog descends along the valleys; it advances like the glaciers, but the glaciers melt at the base, whilst the turf-bog is impeded by nothing.—*Cuvier on the revolutions of the Surface of the Globe*.

8. *On the beneficial effects of Chloride of Lime and Chloride of Soda, when applied to external diseases of the animal system.*—The chloride of lime has been found by Mr Alcock to be an excellent disinfectant. Of the chloride of soda he thus speaks:—"The chloruret of oxide of sodium, in common with that of lime, has been shown to possess the valuable property of destroying the most putrid effluvia arising from animal substances, even when these effluvia are diffused to a considerable extent in the surrounding atmosphere; it has also the property, when applied to the substances giving off these effluvia, of arresting or destroying the progress of putrefaction. Not only does it possess this power with regard to dead and detached animal substances, but in those distressing forms of disease in which a part or parts of the living human body become dead and putrid, whilst yet attached to the contiguous tissues which preserve their vitality, it has the inestimable power of speedily ameliorating this most loathsome condition, by destroying the putrid odour emanating from the dead portions; and it, moreover, generally arrests the further progress of decomposition, and promotes the more speedy separation of the dead parts from the living, than can be obtained by ordinary means. It very often is capable of changing the nature of malignant, corroding and destructive sores, into the condition of simple ulcers: in many ulcers not malignant, it is capable of greatly hastening the cure. In short, though not an infallible remedy, it is capable, under the guidance of medical and surgical skill, sound judgment and experience, of alleviating, and often of totally removing, some of the most distressing and loathsome diseases to which animals are liable." If the chloride of soda be thus useful in human surgery, it will not, probably, be quite inert in the quadruped. We have used it with manifest advantage in a case of flatulous withers, the putrid stage of distemper in dogs, and ulcerations of their lips and gums. A French veterinary surgeon, M. Lard, in the spring of 1805, cured a glandered horse with it; and another military veterinary surgeon, M. Etienne, was most successful in arresting the progress of several diseases among the troop-horses at the barracks of Moulins. The bad forage and situation of this place subjected the horses to attacks of glanders and farcy. Every attempt to arrest these maladies proved abortive, until M. Etienne used the chloride of soda. He diluted the solution of the chloride with twenty-four times its weight of water, and bathed the ulcers with it, and injected it into the nostrils. The defluxion rapidly decreased, and in thirty-five days the animals returned to their work. The usual means of treating these diseases were continued at the same time, but these were perfectly ineffectual before the chloride was used.—*Veterinarian.*

QUARTERLY AGRICULTURAL REPORT.

OCTOBER 15. 1839.

IN England, the showery weather, which set in about the end of June, continued throughout July, and in August the rains were still more incessant. The same wet weather, with few exceptions, continued through the whole of September, and even down to the period at which we write. In Scotland, the weather was much the same as in England during July and August; but in September, though still chequered with a few flying showers, it was much more settled. The season altogether has been a very unpropitious one for the farmer. In the tilling of his fallow, and the cleaning of his turnips and other green crops, he has had to contend with very unfavourable circumstances. His harvest operations have been prolonged to an unusual length of time, and carried on under circumstances of great trouble and expense; indeed, it has required every possible exertion on the part of the farmer to get his crops cut and secured in any tolerable condition.

At an early part of the season considerable alarm had arisen in certain districts of the kingdom, that the wheat crop had sustained injury from the maggot; but the effects from this cause have proved inconsiderable in England, and in Scotland its ravages were limited to particular districts, and, with one exception, have been trifling. Much of the crops were lodged by the heavy rains before they were matured, which created considerable anxiety especially for wheat and barley. This, together with the rain which fell while the grain was cut, and before it could be carried to the stackyard, have, in many cases, given these grains a coarse and discoloured appearance; but from the low temperature of the season, and the cold high winds which frequently prevailed, a small quantity only of the grain is sprouted. As a consequence of such an untoward harvest season, much of the crop, especially in England, has been carried home in a wet state. Where farmers are under the necessity of disposing of their grain in that condition, it must, as the very low prices obtained for such unmarketable grain show, be attended with great loss.

We believe we are entitled to state, that, to the south of Yorkshire, the crops are generally inferior to those in Yorkshire and farther north. With this distinction in view, we may observe in general, that the wheat crop on strong clays was thin, and will be rather deficient in quantity; but that, on superior soils, it is in general a fair average crop, weighing about 63 lb. per bushel. In many cases, however, it is soft, and unfit for the baker without a mixture of old. The barley crop, on stiff soils, was thin on the ground, and will not in such situa-

tions be a full crop, though well-eared; but on kindly soils it is considered a fair average one, and decidedly superior to that of last year. That portion which was lodged by the rains is stained, and inferior in appearance. From the wet state in which the greater part was carried to the stackyard, only a small portion will be fit for malting for a considerable period. The oat crop, though in many cases light, has been got in in tolerably good order; and, though it has suffered, to a certain extent, in common with other grains, it is not so easily damaged by wet weather, and the grain therefore is pretty good. On cold late soils it will be husky, and a little deficient in weight. The crops of beans and peas blossomed well, but were much kept back by the continued rains, and will prove a deficient crop: There are exceptions, however, to this result in particular districts. Turnips are a very indifferent crop: If the season keeps mild for some time, they may still improve a little, but will fall much short of an average produce.

For the last three months, we have had a very uninteresting trade in corn, arising from the total want of speculation throughout the whole season; and though, from the ungenial summer which we have had, we have experienced occasional fluctuations, these have been very trifling, and the rates of all kinds of grain have, upon the whole, varied very little, though latterly they have tended to decline. As the new wheats come to market in very poor condition, and unfit for the baker's use, without a considerable mixture of old, this has the effect of keeping the old qualities at a comparatively high stand, while the price of new depends altogether upon the condition, varying from 42s. to 72s. per quarter.

The stock of old grain is now much diminished; and, at this advanced period of the season, we can expect little from the Baltic, or even from less distant ports, more especially when we take into account the present high duties formed by the low prices of the damp new wheat acting as a prohibition to importation.

The depression in the price of wool has been progressive since the date of our last Report, being greatest on the coarser kinds. Accounts from the manufacturing districts speak generally of an increase of trade. Whether this be one of those temporary oscillations of commerce with which we have so often been deluded, or a tendency to a sounder condition of the country, is yet to be seen; but, at all events, this state of things can as yet have produced no effect on general consumption; and the condition of the agriculturists over a very large part of England, remains as gloomy and depressed as hitherto.

The price of fat stock, which had risen beyond the rates of last year, has recently shown a tendency to decline, but the principal fall has been on lean stock. The injurious effects of a depression in the stock markets has been, in certain districts, aggravated by extensive failures of those engaged in the cattle trade.

TABLES of the Average Prices of the different kinds of GRAIN, per Imperial Quarter, and of BUTCHER MEAT, sold at the following Markets; from 1st July to 30th September 1829.

LONDON.							
Date.	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.	
July 6.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	
13.	70 4	30 5	25 0	33 1	37 9	38 2	
20.	68 2	34 0	23 7	34 2	37 0	36 6	
27.	69 5	31 10	23 1	31 6	36 6	36 0	
Aug. 3.	70 1	32 7	23 7	32 6	37 6	37 6	
10.	70 6	32 1	23 7	33 0	37 0	37 6	
17.	69 4	31 2	23 3	32 0	36 6	37 0	
24.	68 3	30 11	22 10	31 9	36 0	36 6	
31.	69 8	32 1	23 3	32 6	36 0	36 3	
Sept. 7.	70 5	31 9	22 8	31 6	36 6	37 0	
14.	72 4	32 9	24 4	31 0	37 9	38 6	
21.	69 5	33 4	23 6	31 6	37 6	39 0	
28.	67 6	34 11	24 3	31 4	36 9	40 0	
LIVERPOOL.							
Date.	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.	
July 7.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	
14.	62 4	34 0	23 6	32 6	37 6	37 0	
21.	60 7	32 6	22 6	30 6	36 3	37 6	
28.	62 8	31 10	22 6	32 0	36 0	37 3	
Aug. 4.	63 9	32 3	22 6	31 6	35 9	36 6	
11.	64 2	32 3	23 1	32 6	36 3	37 0	
18.	62 6	34 7	23 3	32 6	36 0	36 3	
25.	61 10	35 6	22 9	31 0	35 6	36 0	
Sept. 1.	62 9	35 6	22 7	31 3	36 0	36 3	
8.	65 4	34 1	22 8	31 0	34 9	35 6	
15.	64 6	33 1	22 6	31 6	36 6	37 6	
22.	60 3	32 6	22 0	31 9	36 6	37 6	
29.	60 11	34 3	23 9	31 6	36 0	38 0	
HADDINGTON.							
Date.	Wheat.	Barley.	Oats.	Peas.	Beans.		
July 3.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	
10.	67 11 1/2	31 10 1/2	27 6 3/8	33 8	34 0	34 0	
17.	70 8 1/2	32 0 1/2	26 11 1/4	34 0	34 2 1/2	34 2 1/2	
24.	74 10 1/2	39 4	29 4 1/2	33 0	37 6 1/2	37 6 1/2	
31.	75 10 1/2	39 5 1/2	29 4 1/2	35 9	36 8	35 7	
Aug. 7.	74 12 1/2	38 0 1/2	28 1 1/4	34 6 1/2	34 8 1/2	34 8 1/2	
14.	73 6 1/2	35 7 1/2	28 9 3/4	34 9 1/2	35 7	35 7	
21.	73 11 1/2	38 0	27 11 1/4	35 0	36 5	36 5	
28.	75 6	38 10 1/2	28 5 1/4	35 10 1/2	36 10 1/2	36 10 1/2	
Sept. 4.	73 3	36 3 1/2	26 2 3/8	36 6	37 10 1/2	37 9	
11.	69 7	35 1	23 11 1/2	36 6 1/2	36 11 1/2	36 11 1/2	
18.	63 1 1/2	35 1	23 11 1/2	36 6 1/2	36 11 1/2	36 11 1/2	
25.	69 6 1/2	34 4 1/2	25 1 1/2	37 4	36 11 1/2	36 11 1/2	
EDINBURGH.							
Date.	Wheat.	Barley.	Oats.	Peas.	Beans.		
July 1.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	
8.	71 0 1/2	32 0	28 6	33 2	34 6	34 6	
15.	73 4 1/2	32 6	27 4	34 4	35 6	35 6	
22.	73 4 1/2	32 6	27 4	34 4	35 6	35 6	
29.	76 0 1/2	36 8	29 6 1/2	36 9	38 0	38 0	
Aug. 5.	77 6 1/2	39 10	29 9 1/2	36 9	37 0	37 0	
12.	79 10 1/2	38 6	30 4	34 6	36 0	36 0	
19.	80 8 1/2	38 6	28 4	35 9	35 10	35 10	
26.	73 2 1/2	38 8	29 2	36 6	37 2	37 2	
Sept. 2.	73 2	37 6	27 6	37 0	38 2	38 2	
9.	69 8	36 8	26 6	36 8	36 0	36 0	
16.	70 6 1/2	36 0	24 6	37 2	37 6	37 6	
23.	64 3 1/2	35 6	24 6	37 6	36 10	36 10	

AVERAGE PRICES OF GRAIN AS SOLD IN THE MARITIME DISTRICTS.

Date.	Wheat.		Barley.		Oats.		Rye.		Peas.		Beans.	
	Quarters.	Price.	Quarters.	Price.	Quarters.	Price.	Quarters.	Price.	Quarters.	Price.	Quarters.	Price.
July 3.	35,254	66/2	4,705	32/1	35,916	24/8	158	32/7	409	38/2	4,513	38/3
10.	33,833	66/3	3,790	32/2	43,840	23/5	472	30/11	446	36/3	4,443	38/7
17.	37,315	65/10	3,852	31/4	50,579	23/4	158	30/6	518	36/5	4,078	37/3
24.	36,767	66/2	3,404	32/5	40,132	23/1	264	30/11	400	37/4	3,656	37/2
31.	33,323	66/11	3,606	32/3	42,406	23/4	146	30/8	467	36/10	3,070	38/4
Aug. 7.	38,612	66/10	3,673	31/11	34,311	23/6	375	33/8	620	36/7	4,138	38/5
14.	36,312	66/7	4,786	31/4	31,649	23/5	550	31/5	704	36/10	4,026	38/10
21.	32,262	66/1	2,906	33/2	33,904	22/11	347	32/5	925	36/6	4,092	67/11
28.	33,956	66/4	3,512	33/3	32,081	23/3	321	33/1	1,456	36/7	4,028	38/1
Sept. 4.	44,607	68/3	2,130	33/8	33,981	22/10	667	32/2	1,532	37/3	2,648	38/11
11.	53,313	67/1	3,415	33/10	29,063	23/10	567	31/5	2,667	37/7	4,013	40/3
18.	59,273	61/7	3,408	33/7	50,680	22/9	350	32/9	1,861	35/1	3,005	40/3
25.	74,337	60/3	7,896	34/3	45,922	22/10	819	31/8	2,464	37/1	4,316	40/6

PRICES OF BUTCHER MEAT.

Date.	SMITHFIELD, Per Stone of 14 lb.		MORFETH, Per Stone of 14 lb.		EDINBURGH, Per Stone of 14 lb.		GLASGOW, Per Stone of 14 lb.	
	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
July	6/6 @ 7/9	6/3 @ 7/6	5/6 @ 6/9	5/6 @ 6/6	5/6 @ 6/6	5/9 @ 6/9	5/6 @ 7/3	5/6 @ 6/6
Aug.	5/3 7/3	5/3 7/6	5/6 6/6	5/9 7/	5/9 6/9	6/ 6/9	5/9 7/3	5/9 7/6
Sep.	5/3 7/	5/6 7/3	5/3 6/3	5/ 6/6	5/3 6/6	5/ 6/	5/6 6/6	5/ 7/

TABLE of the Average Prices of GRAIN in the DUBLIN MARKET,
from 1st July to 30th September 1829.

Date.	Wheat Per Boll of 280 lb.	Barley Per Boll of 224 lb.	Bear Per Boll of 224 lb.	Oats Per Boll of 196 lb.	Out Meal Per Cwt. of 112 lb.	Flour Per Cwt. of 112 lb.
July 3.	s. d. 37 10	s. d. 16 0	s. d. 13 6	s. d. 12 2	s. d. 13 9	s. d. 21 8
10.	36 2	16 6	13 6	12 3	13 6	21 2
17.	35 11	16 6	13 3	12 5	13 11	20 9
24.	36 2	17 0	14 0	12 11	14 9	20 11
31.	34 6	16 9	13 0	11 6	14 8	20 11½
Aug. 7.	31 11	16 6	11 10	13 2	14 11	20 9
14.	32 6	17 6	12 6	13 8	15 0	21 3
21.	32 6	17 8	14 6	14 0	15 3	21 6
28.	32 6	17 9	14 8	14 3	15 6	21 9
Sep. 4.	29 10	18 0	14 3	13 10	15 9	20 9
11.	28 8	17 9	13 10	12 10	14 2	21 2
18.	27 8	17 6	12 11	12 10	14 4	21 3
25.	27 10	17 0	12 6	12 4	14 0	20 3

PRICES of English and Scotch WOOL.

ENGLISH, per 16 lb.—*Marino*, Washed, 13/ @ 18/; in Grease, 8/ @ 11/6.—*South Down*, 8/6 @ 11/6; *Leicester Hog*, 10/6 @ 11/6; Ewe and Hog, 9/6 @ 11/.—*Moor*, Ewe and Hog, 3/6 @ 5/.

SCOTCH, per 16 lb.—*Leicester*, Hog, 10/6 @ 11/6; Ewe and Hog, 9/ @ 10/6.—*Cheviot*, Hog, 7/6 @ 9/6; Ewe, 6/6 @ 8/6.—*Moor*, Ewe and Hog, 3/6 @ 4/3.

Averages which regulate the Duties on FOREIGN Grain, 5th October 1829.

	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.
Per Imp. Quart.	64/10	33/7	23/	32/2	35/10	36/5

Duties payable on FOREIGN CORN.

	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.
Per Imp. Quart.	22/8	12/4	12/3	21/3	15/6	11/

FOREIGN CORN MARKETS.

CONSIDERABLE quantities of wheat, oats, and barley, have been imported from abroad during the last three months, in the hope of the averages advancing so as to enable the importer to relieve from bond at a moderate duty; but, since the month of July, the averages have been continually declining, and the duties have at last reached so high a rate as to act as a prohibition to importation, and two-thirds of the wheat in the country was liberated about the close of September, at the duty of 20s. 8d. per quarter. It has now advanced to 23s. 8d., with every prospect that it will reach 26s. 8d. per quarter before it begins again to recede.

Comparatively little duty has been paid on any other description of grain, as it is probable that, at present, the duty will not go higher; while on barley and beans, as well as on peas perhaps, a decline of several shillings in the duties will in all probability take place within a few weeks.

The losses on the recent importations of wheat must have been very great; and upon the wheats still in bond they are not likely to be less, at least till the spring months, when perhaps the improved condition of the new wheats may operate favourably upon the averages, thereby reducing the duty, and consequently the cost, to the importer.

At this period of the season, it may not be uninteresting to be informed of the state of the crops on the Continent, so far as accounts have yet reached us.

HAMBURG.—Although the many showers of rain, and the unfavourable state of our atmosphere, during the critical time, when the growing crops of our winter grain were approaching to maturity, naturally gave rise to serious apprehensions respecting the final issue of the harvest, especially of wheat, still we have been favoured with a much more abundant, and also better conditioned harvest of wheat than could reasonably be expected from the state of the weather. In some peculiar districts, the kernel of the wheat has been partially injured by the unpropitious weather, and the ravages of obnoxious insects; but, from the opinions generally prevailing here, grounded on the inspection of many samples of new wheat, it would appear that this year's grain has been subject to much less injury by sprouting, and will prove of a considerably finer and heavier quality, than last year's produce. The rye and rape seed crops have also yielded abundantly, but they have not been secured in good condition, in consequence of the continued rains when the grain was in a state of maturity.

Respecting the produce of spring grain, we are led to conclude, that, so far as relates to fine malting qualities of barley, the crop in the upper country has been reaped, not only in considerable quantity, but also of a fine quality. As to oats and buck-wheat, we cannot speak with confidence, as a good deal of both still remains in the fields, and we are consequently unable to give any just opinion respecting these plants.

COPENHAGEN.—A continuation of most unfavourable weather during the summer blasted the hopes of very fine crops. However, as far as it is possible to judge, before the corn has been brought to the test of thrashing, the injury done does not appear to be so great as might have been feared; and though this year's produce must be very various in point of quality, its superiority over that of last year appears unquestionable. This relates to all sorts of grain except rye, the crop of which turns out very deficient, and will prove at least one-third short of an average. Our yearly export of this article averages about 150,000 quarters, but this year we shall want foreign supplies.

Wheat is likely to be an average crop. In some parts of the country it has been better secured than in others, and we shall have a great variety of qualities, but, in general, it will prove superior to the produce of last season. We have seen samples, weighing 59 lb. per bushel, from districts which last year hardly averaged 56 lb. Fine bright qualities cannot, however, be expected after so very wet a season. The annual export of this grain from Denmark is computed at 150,000 quarters.

Barley is a plentiful crop; but it is exceedingly various in quality, and much care will be required in making proper selections; the weight in general runs from 50 lb. to 53 lb. per bushel, and in this respect is better than the crop of last year; but a large proportion being blighted and discoloured, bright samples will prove scarce. Our export of barley averages 300,000 quarters per annum. Oats are abundant, and the quality proves good as to weight; the colour is rather indifferent: the yearly average export of this article is about 250,000 quarters. Peas will be under an average; in some districts the crop has been secured early, and proves of good quality; in others, the injury done by sprouting, amounts to nearly a total failure: yearly export of this article about 200,000 quarters. No part of the present crop has yet appeared for sale, and there being no stock left from last year, our quotations must be nominal. Unless the markets in England should take a start, or the demand for Norway or Sweden interfere, prices will probably open at rather reduced rates.

BREMEN.—The general heavy rains that fell during the time of reaping, caused considerable damage to all sorts of grain, and our farmers, desirous that their crops should not be totally lost, and to save as much as possible, were too hasty in housing during the unfavourable weather, and the damage thus done to the quality has been great. Barley, oats, beans, and peas, will yield fully a third less than they did last year.

Here and in the neighbourhood the stock of old corn is quite trifling; unless a demand from England springs up, it is probable that our prices will not advance.

Pomeranian, Mecklenburgh, Hanoverian, and Brunswick wheats may be quoted from 44/ @ 48/. Inferior, 40/ @ 44. Barley, 21/ @ 23. Oats, 14/ @ 15/. Beans, 25/ @ 28/ per imperial quarter free on board.

ANTWERP.—The late favourable weather which we have experienced, has enabled our farmers to secure a good deal of their rank crops, which, if a change had not taken place, must have been almost entirely lost. The sup-

piles of new wheat are not more than are required for our daily wants, and for good lots, weighing 60 @ 61 lb., a price equal to 50s. continues to be paid. Of old wheat scarcely any is left, and the little that remains is so affected by weevil and maggot, that no shipment of it can be properly made.

The demand for all kinds of grain is steady. Our own wants, and an occasional purchase for exportation for the neighbouring French markets, are sufficient to maintain our prices; and, as the deliveries of new grain are composed of very various qualities, which tend to confirm our opinion of the inferiority of the crop, no decline can be anticipated, but, on the contrary, present prices will probably be maintained.

DANTZIG.—In all our neighbouring provinces, and in Poland, the weather has been pretty favourable for harvesting;—wheat, rye, barley, and a considerable proportion of the peas, have been housed in fine condition. The quality of the new wheat, as well as of all other grain, is fine, healthy, and heavy. Some samples of new wheat that have appeared, weigh 152 lb. (Dutch scale), and of rye 124 lb. @ 128 lb.

Wheat and barley are estimated to yield above average crops; but rye considerably below, having suffered by the severe frost in winter. Prices here will, in a great measure, be regulated by the demand from England.

Present currency,—Wheat,	. 20/ @ 54/	Oats,	. . 9/ @ 11/
Rye,	. . 15/ 18/	Peas,	. . 15/ 18/
Barley,	. 11/ 13/		

Per imperial bushel, free on board.

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ON NATURAL PASTURES*. *By* W. MACGILLIVRAY, Esq. A. M. &c.

IN commencing an attempt to exhibit a general view of the pastures of Scotland, it is unnecessary to offer any remarks respecting the advantages likely to result, in a commercial and agricultural country, from attention to a subject so intimately connected with its prosperity. I have only here to observe, that the outline which I present is exclusively the result of personal observation, and to express a wish that they who find it inadequate to the conveyance of a full impression, may reflect that the entire development of the subject would occupy more space than can be allowed to it in a work like the present.

If we make a general survey of Scotland, we shall find that country divided into three great portions, the northern, the

* Though this description of Natural Pastures bears relation chiefly to Scotland, it is in a great measure applicable to the mountainous and hilly parts of England also, as well as to those of Ireland. It will not, however, answer as a general description of the vegetation of a particular zone, confined within definite limits of latitude; for on both sides, on the continent of Europe and on that of America, the vegetation differs greatly within the same latitudes, more especially in the latter continent. Nor can the author presume to make general reference to all parts of the British Islands. In fact, it is much more useful to describe certain portions of them separately. Similar views of the pastures of England and Ireland would afford data for comparison, and would show in what respect these countries, and that here described, agree with each other.

middle, and the southern. The first of these is separated from the second by the Moray Firth on the eastern side, the Linnhe Loch on the western, and the valley extending from Fort William to Inverness, occupied in the greater part of its extent by lakes; the second is separated from the third by the Firth of Forth on the one side, the Firth of Clyde on the other, and a line drawn from Glasgow to Stirling. The third district is bounded toward the south by the Solway Firth, and the English frontier. The northern division is almost entirely mountainous, a small portion of the eastern coast alone presenting an exception to this general character. Of the middle division, the western half is also mountainous, which is also the case with a great portion of the other half, so that the littoral districts alone, and several extensive vales, straths, and carses, together with the greater proportion of Fife, Kinross and Clackmannan, are comparatively low. The southern division exhibits a great central range of mountainous and hilly ground, but possesses more extensive low tracts than either of the others, from which it differs in having the western parts flat.

The fundamental disposition of the ground may be said to be in all parts mountainous. I shall therefore commence with the description of the mountain pastures, and for the purpose of exhibiting the essential characters of these pastures, shall select the elevated ground situated at the sources of the Dee in Aberdeenshire, which I have examined with some attention. None of the Scottish mountains reach the line of perennial snow; but, in this district, their elevation is such, that patches of snow are to be seen in hollows at the warmest season, and remain undissolved until the next fall adds to their extent. The bleak summits of these mountains, exposed to the depressing influence of a low temperature, boisterous winds, and abundant rains, covered for a great part of the year with snow, and presenting either bare rock, or a shallow gritty soil, produce few plants of any description, and hardly a dozen of those which are selected by sheep as their food. These latter consist of three or four carices, or hard grasses, one or two junci or rushes, some tufts of *Scirpus cæspitosus*, or common club-rush, together with *Festuca vivipara*, and one or two other

grasses. Intermingled with these are to be seen *Salix reticulata*, *Apargia Taraxici*, *Polygonum viviparum*, and, in particular spots, several *Saxifragæ*, *Rhodiola rosea*, *Statice Armeria*, and *Silene maritima*. The extreme heights scarcely present any other phenogamic vegetation than *Silene acaulis*, *Salix herbacea*, and *Statice Armeria*.

Farther down the mountains, in places comparatively free of rocky surface, and occupying a zone extending downwards to the height of about 3000 feet above the level of the sea, we find a vegetation still poor and stunted, but by no means deficient in beauty, and perhaps affording better pasturage than some of the lower grounds. The Gramineæ and Leguminosæ form the fundamental plants of pasturages; but here there are hardly any of the latter, and, in place of the former, of which the only species that occur are *Festuca vivipara*, *Aira lævigata* and *flexuosa*, we find irregular patches of verdure, consisting chiefly of *Carices* and *Scirpus cæspitosus*, which, however, are also eaten by sheep. By the streamlets are several species of alpine plants, *Saxifragæ*, *Epilobia*, and others, which are more objects of research to the botanist than of food to cattle, and some stunted tufts of *Empetrum nigrum*, *Vaccinium Myrtillus*, *Juniperus alpina*, and *Galium saxatile*.

Pastures of this elevation are of very little importance. The scanty supply of food which they yield, is, indeed, eagerly sought after by sheep in the fine weather of summer; but their elevated situation is productive of danger to these animals in autumn, and during the winter, they are generally covered with snow, even in the islands and maritime districts of the western and northern coasts.

Farther down the mountains, *Aira flexuosa* grows, in tufts, and of large size. Several carices form a tolerable sward in many places; *Agrostis vulgaris*, *Nardus stricta*, and *Melica cærulea*, occasionally occur; the latter of diminutive size. Here *Calluna vulgaris* first makes its appearance in stunted tufts.

As we proceed downwards, and arrive at the places where the mountains begin to expand, we enter upon a region, the predominant feature of which consists of *Calluna vulgaris*, or Common Heath, mingled with *Erica cinerea*, the grey-leaved

heath. The vegetation becomes more vigorous. The carices are stronger and more numerous; various grasses present themselves, and whole tracts, especially of spongy ground, are covered by *Scirpus cæspitosus*, intermingled with *Carices* and *Eriophora*.

The valleys of this region, in the bottom of which flow the streamlets collected from the overhanging heights, are generally more verdant than the open ground. The heaths are less abundant, and the pasturage consists chiefly of *Carices* and *Gramineæ*, intermingled with many of the plants of ordinary pasture-grounds, such as *Lotus corniculatus*, *Anthyllis vulneraria*, *Polygala vulgaris*, *Juncus conglomeratus*, *Caltha palustris*, &c.

The general aspect of the vegetation, however, is heathy, and continues so until we reach the vicinity of the river. Among this heath we find abundance of *Empetrum nigrum*, *Vaccinium Myrtillus*, *Vaccinium Vitis-idæa*, *Arbutus Uva-ursi*, *Myrica Gale*, *Genista anglica*, and *Rubus Chamæmoris*. In these valleys there appears to have been much wood at a former period, consisting chiefly of *Pinus sylvestris*. At present there is scarcely any, and the few trees that present themselves occur along the streams. They consist of the common poplar, *Populus tremula*, the white birch, *Betula alba*, and the mountain ash, *Sorbus aucuparia*.

This account of the vegetation of the central heights of the middle great division of Scotland, will answer equally well for mountainous districts in all parts of that country, and even in the islands, the same phenomena being everywhere exhibited, from the mountains of South Uist or Skye, to those of the Southern Grampians.

Up to the elevation of nearly 2000 feet above the sea, in open places, the general aspect of the vegetation, in all parts of Scotland, is heathy; and it is only in the vicinity of the sea, or in those places where the original nature of the ground has been altered by cultivation, or which are frequented by men and domestic animals, that we find the *gramineæ* predominating over the heaths and carices. The fundamental soil is peat, that is to say, a soil composed of the partially decomposed roots, stems and leaves of heaths, carices, sphagna, and many other

plants, spongy, soft, retentive of moisture, peculiarly favourable to the growth of certain plants of comparatively little value, and adverse to that of the Gramineæ, Leguminosæ, and the plants used in agriculture. This heathy ground occupies a very large proportion of all parts of Scotland, and on this account is worthy of more attention than it has hitherto received.

The diversities presented by heathy ground are more numerous than one might at first imagine; and as these diversities produce corresponding differences in the value of heath as pasturage, it will be necessary to advert to them.

As a specimen of the worst kind of heath or moor, we may select that which presents itself along the road from Aberdeen to Stonehaven. The soil consists of peat, frequently of great depth, forming bogs, in which the vegetation consists of *Sphagna*, or Bog mosses, *Carices*, *Scirpi* and *Junci*. These bogs are filled to the brim with water during three-fourths of the year, and are never entirely dry. Large patches of the unsightly soil are left destitute of vegetation, and in the midst of the pools are seen lumps of solid peat, crowned with tufts of heath and carices. Portions of ground of a more solid texture, and more free of moisture, are interspersed, which are covered with *Calluna vulgaris*, *Erica cinerea*, and *E. tetralix*, together with numerous carices, and a variety of plants common to heathy soils, but of no value as pasturage, such as *Pedicularis sylvatica*, *Ranunculus Flammula*, *Drosera rotundifolia*, *Orchis maculata*, *Myrica Gale*, &c. Numerous pools, and occasionally small lakes, present themselves, the marginal vegetation of which is in no degree superior to that of the surrounding ground. Various species of *Carex* and *Equisetum*, a few willows, *Ranunculus Flammula*, *Caltha palustris*, and other plants peculiar to a moist soil, here present themselves. The deep-brown water of these pools and lakes renders them peculiarly repulsive; and there is no ground, not even drifting sand, with its withered, and scanty, and half-suffocated vegetation, that exhibits so melancholy a picture as an extensive tract of peat-bog of this description. This kind of moorland is not uncommon in many parts of the Lowlands, and in the Highlands and Isles may be occasionally met with in low tracts, occupying the bottoms of valleys, and sometimes parts of considerable elevation between mountain

ranges, as in the Island of Lewis, and in the district called the Black Heath, near the upper part of Glencoe. Black and brown are the predominant colours. The very sand of the lakes and rivulets is tinged with the latter. Cattle in a weak state, in spring especially, picking their way among the tufts, and enticed by the straggling patches of verdure interspersed, sometimes flounder in the mud, and are unable to extricate themselves, of which occurrence I have myself seen several instances.

The next variety to be described is by far the best as pasturage. The surface is sloping, and more or less smooth, with only occasional breaks, in which the soil appears. The latter consists of soft spongy peat, almost entirely composed of long slender interwoven fibres. The vegetation is a kind of rough sward, consisting for the greater part of the common Club-rush, *Scirpus cæspitosus*, intermixed with Cotton-grass, *Eriophora*, some Carices, and a few grasses, as the purple melick, or *Melica cærulea*. In many parts of Scotland, this variety of heath or moor pasture presents itself to a great extent; but it is nowhere to be seen in greater perfection than in the lower parts of the Outer Hebrides. It forms excellent summer pasturage for cattle of all kinds, more especially for black cattle; but, in winter, being generally extremely wet, from the soft and spongy nature of the soil, is in a great measure useless. The *Scirpus cæspitosus* is readily eaten by cattle in summer and autumn, when it is fresh and green; and, upon extensive farms, a large supply of it is peculiarly beneficial as pasturage, when the cattle are kept from the wintering grounds.

On more steep declivities, where the water is permitted to run off, the moorlands present a different kind of vegetation, consisting of the two common heaths, *Calluna vulgaris* and *Erica cinerea*, of large size, and growing in tufts, interspersed with a few grasses and other plants. This kind of heath is less valuable than that last described. As heather itself is very little eaten by sheep or other cattle, indeed is hardly ever touched by them, unless when just sprouting in the early part of summer, or during snow-storms, it is the general practice to burn the kind of heath here described in February or March, before vegetation has made progress. The consequence of this burning

is, that a bare surface is procured, entirely freed of heath, on which a sparse vegetation of carices, sedge, *Melica coerulea*, *Poa ovina*, *Aira flexuosa*, and some other grasses, is produced in the ensuing summer. As the heath plants have been destroyed only down to the surface, their roots remaining untouched by the fire, a dense crop of very short heath also appears among the grasses, which next season increases in height, and in the course of four or five summers attains its original appearance. The ground receives very little improvement from this practice, and the only remedy for the renovated evil, is to repeat the burning at intervals of a few years. The object of burning this kind of vegetation is to destroy the heath, and thus give room for development to the grasses which grow interspersed among it. The young shoots of *Melica coerulea* are eagerly sought after by sheep, and the heath itself, when young, is occasionally eaten by them.

There is another kind of heath which occurs frequently, and of great extent, in the lower districts of Scotland. The soil is peaty, but thin, and immediately under it is a layer of sand or gravel. The latter circumstance prevents the rain-water from lodging in the peat, which, during summer, is commonly dry, and more or less hard. The vegetation consists of short heath, *Calluna vulgaris* and *Erica cinerea*, intermixed with *Arbutus Uva-ursi*, *Empetrum nigrum*, and the various plants which occur in the other kinds of heath-pasture, together with some of the species of ordinary pasture plants of good soil, such as Birdsfoot clover, *Lotus corniculatus*, *Anthyllis vulneraria*, *Euphrasia officinalis*, &c. Low hills, the declivities of higher grounds, and extensive tracts of flattish country, are covered with this kind of pasture, which is more abundant on the eastern parts of the middle division of Scotland, and on the higher grounds of the southern division, than the other varieties.

In other places, whole tracts of this dry and short heathy pasture are covered with large bushes and thickets of whin or gorse, *Ulex Europæus*, and juniper, *Juniperus communis*, which give a peculiar appearance to the landscape. The low heaths along the Beaully Firth, and those of Nairn and Moray shires, afford the best examples of this variety of heathy pasture, which is upon the whole more valuable than most of the

other kinds, on account of the considerable quantity of short pasturage, consisting of the more ordinary plants, which grows in it, although the predominant species, the whin and juniper, are of no value. In certain parts of Aberdeenshire, however, the former plant is ground or bruised in stone-mills, and mixed with hay and other food for horses.

These are the predominant varieties of heath in Scotland, viewed in a general sense; but the varieties produced by the intermixture of these in a given portion of ground, are very numerous. In all kinds of heath there are patches and stripes of more or less continuous verdure, and upon the predominance of these depends the value of the ground as pasturage, as well as upon the comparative dryness of the soil. Heathy districts abounding in *Nardus stricta*, *Melica cœrulea*, *Festuca ovina*, *Carices*, *Junci* and *Eriophora*, interspersed with *Lotus corniculatus*, *Anthyllis vulneraria*, *Euphrasia officinalis*, and the ordinary pasture plants, are the best, because they afford food for sheep at all seasons, and are generally dry. For summer pasturage, heaths, covered with an almost continuous sward of *Scirpus cæspitosus*, intermixed with *Carices* and *Eriophora*, are superior to any other, but being always spongy, are unfit for winter pasture.

A given surface of heath is greatly more valuable, when diversified in its inclination by being formed into hollows and eminences, by mountains and hills, than when extended on in continuous flatness, because the variations of declivity afford corresponding variations in the species of pasturage. Let any one compare the long dreary slopes of the Lammermuir range, Drymen Muir, or the Black Heath, with the Pentland or Ochill hills, and he will readily perceive the difference. Besides, the advantages procured by shelter from predominant winds, or occasional storms, are on the side of the latter. But, as subjects of agricultural improvement, the more level heaths, especially those of which the subsoil is sandy or marly, are greatly superior to the others. There can hardly be a more hopeless subject to which human industry can be applied, than an extensive swamp of deep peat, for should the waters be drawn off, the soil is still so adverse to cereal vegetation, that nothing less than the almost entire removal of it can effect the purpose intended, and even

this can only answer where there is a subsoil of gravel or clay, as is the case on Drummond Moss.

Such, then, is the general nature of the vegetation of Scotland in its original state, unmodified by human industry, in the internal and more open parts. One who may wish to obtain a general idea of this vegetation, as seen in a space capable of being traversed in a few hours, has only to betake himself to any of the larger Hebrides, where he will find all the varieties above described variously blended. But, to complete the picture, we have still an extensive field to travel: we have to view the vegetation of the mountain ravines and valleys, that of the sides of the larger rivers, as they travel from their sources towards the sea, the sylvan vegetation, which is still so abundant in many parts, and the vegetation of the littoral districts.

The mountains enclose valleys, often of great length, and the sides of these valleys are furrowed by ruts and ravines, in which the streamlets descend to join the principal stream. Many of these principal streams, each flowing in its own valley, in like manner unite to form the rivers. By these circumstances we shall be guided in our description of the pasturage. The ruts and ravines present a vegetation more or less different from that of the surrounding heaths. In them more verdure is displayed. Herbaceous plants of numerous species, belonging to the lower grounds, have straggled into them, and have there blended with the alpine vegetation. Trees of various species here begin to make their appearance, and increase in number along the valleys. The principal streams are marked by the improvement which they effect in the vegetation along their course, converting it into green herbage. The rivers exhibit the same phenomenon, generally in a still greater degree, and are margined by woods. As we follow them, we find the pasture improving in quality and luxuriance, until we meet the vegetation of the littoral districts, which we now proceed to examine.

The vegetation of a country is peculiarly influenced by its soil, not so much, however, in reference to the species, as to their distribution and luxuriance. The soil itself is greatly influenced by, and intimately connected with, the nature of the subjacent rock or strata. In fact, any attempt to present a view of the vegetation of a country, without considering in connection

the numerous relations of that vegetation, must fail to be in any degree instructive, for which reason I consider our Floras; which are mere descriptive catalogues of species, as reducing to the most meagre and imperfect form a subject capable of exciting the highest degree of interest, when developed in a suitable manner.

In the mountainous districts, which occupy most of the northern, the greater portion of the middle, and a great part of the southern division, there is comparatively little soil upon the high grounds. Even the valleys contain no remarkable quantity. But as we descend towards the lower and secondary districts, the soil, consisting of alluvial matters, greatly increases in depth. The great valleys towards the mouths of the rivers, in particular, contain vast deposits of sand, clay and mud. Lastly, the shores of the sea, at intervals, present accumulations of sand, often of great extent. What is called soil in an agricultural point of view, is a thin surface layer, produced naturally by the intermixture of the decayed vegetation with the loose matters in which it has fixed itself, or artificially by the repeated turning and intermingling of these loose matters, to which various substances are added. In the more elevated parts, where there is little loose matter superjacent to the rock, the lichens have gradually prepared a soil for the heaths and other plants; and in the less elevated parts, where the junci, scirpi, sphagna, &c. have originally fixed themselves, their fibres and stems becoming only partially decomposed, have gradually accumulated; and thus has been produced the peat-soil, with its peculiar vegetation, so prevalent in all parts of Scotland. In alluvial tracts, however, the case has been different, and the vegetation there, being of a nature attractive to herbivorous animals, has not been allowed to accumulate its remains.

In glancing at the vegetation of one of our smaller islands, one is greatly struck by the difference presented by proximity to the sea. The whole of the interior may be heathy; but along the shores we observe a zone of verdure, varying in breadth according to circumstances, in general easily apprehended. Just so is it with the Mainland of Scotland. Of the peculiarly maritime plants we need scarcely speak here, as they hardly form collectively a constituent of any importance of the pastures of

the littoral districts. In open, elevated, and dry parts of the coast, we find a vegetation, not indeed luxuriant, but of a pleasing verdure, and peculiarly rich in nutritive species of plants. Of the Gramineæ, which form the basis of this vegetation, the Sheep's fescue, *Festuca ovina*, is generally the most predominant. Along with it we observe the Ryegrass, *Lolium perenne*, the crested dog's-tail grass, *Cynosurus cristatus*, *Aira cristata*, *Aira caryophyllæa*, *Agrostis vulgaris*, and several other grasses. The Leguminosæ are also very abundant, and consist of bird's-foot clover, *Lotus corniculatus*; Anthyllis *vulneraria*; white clover, *Trifolium repens*; red clover, *Trifolium pratense*, and yellow clover, *Trifolium procumbens* and *minor*; several vetches, *Vicia Cracca*, *sepium*, *sativa* and *lathyroides*; black medick, *Medicago lupulina*; *Lathyrus pratensis*, and other species. Intermingled with these is a vast variety of species not reducible to method in any natural description, as they exist in the pasturage in no definite order. Of these I shall enumerate only the more remarkable for their utility as food to cattle; the ribwort and other plantains, *Plantago lanceolata*, *media* and *maritima*; the daisy, *Bellis perennis*; milkwort, *Polygala vulgaris*; *Polygonum viviparum*, *Heracleum sphondylium*, *Luzula campestris*, *Ranunculus repens* and *bulbosus*, *Carex stellulata*, *curta*, &c.; or for their beauty, *Orchis latifolia*, *mascula* and *maculata*; *Ononis arvensis*, *Chrysanthemum Leucanthemum*, &c. It were needless to enumerate all the species that occur in this kind of pasture, which extends to a variable distance from the sea, according to circumstances.

In certain places along the coast, but more especially in small islands, there occurs a very luxuriant herbage, consisting principally of *Festuca vivipara* and *duriuscula*, intermingled with *Statice Armeria*, *Plantago maritima*, and a few other plants, which possesses an extraordinary power of fattening sheep. I may mention as an example, the islet of Copay in Harris, which, although it contains only about two acres of good grass, is capable of fattening in the highest desirable degree from thirty to forty sheep, in the space of a few weeks in autumn, while, at the same time, a great proportion of the grass is devoured by the flocks of wild geese, which frequent it. "The Flannan Isles" off the west coast of Lewis, says the Reverend Mr Hugh Munro, in Sir John Sinclair's Statistical Account, vol. xix. p. 283., "are famous for

fattening sheep, each of which have always at a time two lambs every season. Sheep brought from these isles," he adds, "do not live for any time on the continent of Lewis." So also, in the same volume, p. 276., it is said by the Reverend Mr Simson, with respect to the Shiant Isles, between Lewis and Skye, that "they are famous for fattening sheep, but particularly some small rocks in their neighbourhood, which have grass on their tops." These rocky islets are destitute of spring-water, and one might imagine that this circumstance would prove injurious to the cattle. Whether the fattening quality of the grass may depend in any measure upon the quantity of salt with which it is impregnated, from the spray of the sea, which is dashed over it in rough weather, I cannot say, although there is probability in the supposition.

In various parts along all the coasts of Scotland, there are accumulations of sand, sometimes of great extent, frequently loose and drifting about, to the great injury of the neighbouring lands. Accumulations of this kind may be seen, for example, along the southern slope of the Moray Firth, on the coast of Aberdeenshire, from the mouth of the Ythan to that of the Dee, on the coast of Ayrshire, and on that of the Outer Hebrides. Whether this sand be calcareous, as it generally is on the western coasts, or siliceous, as on the eastern, the phenomena of vegetation which it presents are the same. Where the sands have accumulated into heaps, immediately behind water-mark, the vegetation consists for the greater part of coarse tall grass, rejected by cattle of all kinds, and consisting of tufts of sand-bent, *Arundo arenaria*, mingled with *Triticum junceum*, *Festuca duriuscula*, and a few other plants.

Behind these sand-hills, there frequently exists a tract of variable breadth, little elevated above the sea, and liable to be more or less covered by drifting sand. Here the *Arundo arenaria* has almost entirely disappeared, and the vegetation consists of the pasture plants which form the general vegetation of all the open parts of Scotland that are not heathy. Where the ground behind this is low, and consists of good soil, the vegetation continues the same inland. Land of this description is in most parts of the low country of Scotland named *Links*, and in the Hebrides *Machar*. Although in winter it in many

places presents the appearance of a plain of drifting sand, entirely destitute of verdure, it generally in summer exhibits a luxuriant and highly diversified vegetation, rich in nutritious species, and in the highest degree adapted for pasturing.

When there are moors or mountain ground behind these links, an intermixture of the different vegetations of the grounds takes place, producing an equally luxuriant, but less lively vegetation, well adapted for wintering. In this ground, as well as on the links themselves, there is in many parts of the east coast of Scotland, and on the west coast of the southern division, an abundance of *Ulex europæus*, with occasional tufts of broom. The western and northern portions of the Mainland, and the whole of the Hebrides, as well as the Shetland and Orkney Isles, are, however, free of these plants, which are productive of more inconvenience than utility in any kind of pasture ground.

The slopes of mountains and hilly ground not very distant from the shores, on which the soil is produced by the disintegration of the subjacent rock, or consists of diluvial matters of little tenacity, are frequently covered with a rich vegetation, consisting chiefly of Gramineæ and Cyperacæ, intermingled with numerous other tribes of plants. Some of these grounds probably owe their verdure to their proximity to large towns, or highly cultivated districts, it being well known that the trampling of men and cattle, together with the excrements of the latter, have a marked tendency to improve the pasture. Of this kind is the King's Park near Edinburgh, and the conical hill, behind the town of Dundee. Examples of the same kind may be seen, of small extent, on every grazing farm, where the vicinity of folds, fanks, and sheilings, is always more verdant than the surrounding parts. Mountain slopes, on which ferns abound, and especially *Pteris aquilina*, are generally covered with excellent grassy pasture, of which examples may be seen in parts of almost every glen in Scotland.

The shores of the firths and large lochs which run into the country, on all sides, present little difference from the open coasts, in respect to the pasturages which they afford. They are, however, more wooded, and this circumstance renders them less exposed to the inclemency of the winter storms. In gene-

ral, the pasturage afforded by woods, when the trees are close, is of a very inferior description. The graminæ, as well as the other plants, have there a decided tendency to shoot up into long, slender, feeble-looking stems; and even where the trees are thinly placed, the vegetation is never so dense as in open grounds. The fallen leaves of these trees are never eaten by cattle, but it would appear that those of certain species might be beneficially employed as fodder, when mixed with hay. Along the eastern coasts of all the divisions of Scotland, and the western coast of the southern, there is a remarkable deficiency of natural wood, insomuch, that it is only along the rivers, and in certain sheltered creeks and ravines, that any is to be seen. But the case is very different along the western coasts of the northern and middle divisions, where all the lochs and creeks with which they abound are beautifully fringed with woods composed of numerous indigenous species of trees. These trees are of the following species:—*Betula alba*, *Quercus Robur*, *Corylus Avellana*, *Populus tremula*, and *Alnus glutinosa*. The fir, I have never met with on the coasts, and if it exists along any of the lochs, it must be of rare occurrence. *Sorbus aucuparia*, *Fraxinus excelsior*, *Prunus Padus*, *Ilex aquifolium*, and various species of willow, are interspersed. Hardly any scenery can be more beautiful than that of some of the Highland lochs, during summer and autumn, where a narrow arm of the sea, presenting the appearance of a large river, or inland lake, winds among lofty and precipitous mountains, whose summits are crowned with verdure, while their sides are covered with brown heath, interspersed with patches of grass, and their bases, forming gentler slopes, or ending in abrupt promontories jutting out into the water, are clothed with birch woods, and thickets of brambles, roseshrubs, and honeysuckles.

The broad valleys in which the larger rivers generally flow towards their termination, having deep deposits of alluvial soil, are either naturally productive of good pasturage, or have been converted into cultivated ground. They are skirted by woods, which extend along the river, following its branches up to their sources, although not continuously. These low grounds or carse, and the fertile bottoms in which the branches flow, or the straths, are seldom heathy in the natural state, and the latter,

when not cultivated, are always marked by verdure, and give harbour to the ordinary pasture plants which occur in all kinds of soil, and most kinds of situation, where peat, with its heathy covering, does not exist. It will therefore be easily imagined how much the general heathy surface of the country is intersected by stripes of verdure, when every valley, of whatever extent, has its rill or stream. These stripes of verdure, indeed, are in many districts extremely narrow, and in the more open heaths, sometimes do not exist along the streams. The numerous lakes of the interior participate in the general character of the rivers, as to the vegetation of their banks, and the slopes of the enclosing mountains. But in the islands, and in several parts of the mainland, the lakes exhibit no difference in their marginal vegetation from that of the surrounding heaths, while their dark brown waters, instead of giving beauty to the landscape, add to its gloom.

We have now traced, on the one hand, the heaths, from the sides of the mountains to the shores, and on the other, the verdure of the shores, to the little glens and ravines of the mountains. But to complete the sketch, we should have to add the great extent of cultivated land which, in all parts of the country, stretches from the coasts towards the interior, here presenting itself in continuity of surface over great tracts, there winding in narrow stripes along the valleys, or existing only in few and far-between patches and spots. But this does not properly form part of our subject, and would extend the description beyond the prescribed limits.

I have refrained from mentioning the cryptogamic vegetation of these pastures, because I am not aware of a single species that is of any importance as food for cattle. Every body knows that rocks and stones in all districts are crusted with lichens of numerous kinds. Many of the heaths also, are very abundantly stocked with cryptogamic plants. Mosses are plentiful in all kinds of pasturage, and greatly deteriorate many of the finer kinds. But they have their uses in the economy of nature, where the object was not alone to produce food for herbivorous mammifera. The fungi, which swarm in our woods, are utterly useless for the latter purpose; and we may dismiss the whole cryptogamic vegetation, with the remark, that a few species of

marine Algæ, furnish an occasional morsel to black cattle during snow storms, when they are unable to procure better food.

The pasture plants which form the principal food of cattle in this country, are the following:—The most important belong to the great natural orders of the Gramineæ and Leguminosæ. Of the former, there are 90 species which occur in Scotland. Of these 90 species, upwards of 20 are of general distribution, occurring in ordinary pasture grounds, at all elevations, up to the height of nearly 2000 feet: *Agrostis canina*, *vulgaris* and *alba*, *Holcus lanatus* and *avenaceus*, *Aira cristata*, *flexuosa*, *caryophyllea* and *præcox*, *Phleum pratense*, *Alopecurus pratensis*, *Poa pratensis*, *trivialis*, *compressa*, *annua* and *decumbens*, *Avena pubescens* and *flavescens*, *Cynosurus cristatus*, *Festuca ovina* and *duriuscula*, *Bromus mollis*, *Lolium perenne* and *Anthoxanthum odoratum*. Of the rest, some are maritime, as *Arundo arenaria*, *Elymus arenarius*, *Triticum junceum*; others occur by way-sides and hedges, as *Bromus sterilis*, *Triticum caninum* and *repens*, *Hordeum murinum*, *Festuca pratensis*, and *Dactylis glomerata*; others in the shade of woods and thickets, as *Melica nutans* and *uniflora*, *Festuca gigantea* and *calamaria*, *Bromus sylvaticus* and *asper*; others by the margins of streams, lakes, and marshes, as *Alopecurus geniculatus*, *Phalaris arundinacea*, *Poa aquatica* and *fluitans*, *Aira cæspitosa* and *Arundo Phragmites*; while some are peculiar to open heaths, as *Nardus stricta*, *Melica cœrulea* and *Sealeria cœrulea*; and others occur only towards the summits of the higher mountains, as *Phleum alpinum*, *Poa cœsia*, &c.

The Leguminosæ are next in importance to the Gramineæ, and by their rich inflorescence, greatly beautify our pasture grounds. Those which present themselves more commonly, are *Trifolium pratense*, *repens*, *arvense*, *procumbens* and *minus*, *Medicago lupulina*, *Anthyllis vulneraria*, *Lotus corniculatus*, *Vicia sativa*, *sepium* and *Cracca*, *Ononis arvensis*, *Lathyrus pratensis* and *Ervum hirsutum*. The others are of less frequent occurrence, and present themselves in corn-fields, in woods, by hedges, &c.

Next to these two families are the Cyperaceæ, an extensive tribe of plants commonly known by the name of hard or moor-grasses, of which there are about sixty species indigenous to

Scotland. Although some of them occur in all kinds of pasture ground, they are to be met with more abundantly on heaths. The larger species, as *Carex riparia*, *paludosa*, *vesicaria*, and *arenaria*, *Eriophorum polystachion*, and *angustifolium*, *Scirpus lacustris* and *palustris*, are not eaten by cattle; but the smaller, as *Carex dioica*, *intermedia*, *stellulata*, and *ovalis*, and especially *Scirpus cæspitosus*, as has already been seen, are not ungrateful to them.

These plants form the basis of all the pasturages, and by their abundance in a given tract, its value may be estimated. On the contrary, when they are sparsely scattered among more numerous and more abundant species, the pasturage is of comparatively little value.

Various other species of plants, however, are eaten by cattle. Of these, the more generally distributed are the daisy, *Bellis perennis*; the dandelion, *Leontodon Taraxacum*, and *palustre*; *Polygonum aviculare*; *Ranunculus bulbosus*, and *repens*; *Plantago media*, and *lanceolata*; *Rumex acetosa*, and *acetosella*; *Achillea Millefolium*; *Campanula rotundifolia*; *Pedicularis sylvatica*; *Bartsia Odontites*; *Rhinanthus Crista-galli*; *Primula vulgaris*, &c. In fact, it is well known that a cow, a horse, or a sheep, confined to a limited spot, will eat to the ground all the species, of whatever nature they may happen to be, that occur upon it, excepting such as are of rank growth, as the ragwort, *Senecio Jacobæa* and the bur-dock, *Arctium Lappa*, and those possessed of bitter, acrid, or narcotic qualities, as mugwort, *Artemisia vulgaris*, celery-leaved crow-foot, *Ranunculus sceleratus*; and henbane, *Hyoscyamus niger*. When left at liberty, indeed, cattle usually make a selection, preferring the graminæ and leguminosæ; and even of the former rejecting those which have shot up and come into seed. In natural pastures, for example, we generally see great quantities of *Holcus lanatus*, *Cynosurus cristatus*, and other grasses left standing, while all the species around them are croped close to the ground. In spring also, cattle eat the young shoots of plants, which, at a more advanced season, they would not deign to touch, as *Chærophylum sylvestre*, *Daucus carota*, &c.

It is singular with what avidity Highland cows eat certain plants, when gathered and laid before them at milking-time, which in

other circumstances they would hardly touch. Of this kind are field-mustard, *Sinapis arvensis*; charlock, *Raphanus Raphanistrum*; chickweed, *Stellaria media*; marsh marigold, *Caltha palustris*; cow-parsnip, *Heracleum sphondylium*; sorrel, *Rumex acetosa*; corn-marigold, *Chrysanthemum segetum*; and ox-eye, *Chrysanthemum leucanthemum*. Our indigenous plants have been greatly neglected, with respect to their capability of affording food for cattle, when cultivated. Every body knows the importance of red and white clover, black medick, and ryegrass, as subjects of artificial pastures; but are there not many other plants, that, by similar treatment, might prove equally advantageous? *Heracleum sphondylium*, for example, nearly the largest of our native herbaceous species, might, by culture, be made to shoot up to the height of a hollyhock, and, of its bland and pleasant taste, any one may, in addition to the testimony of the Hebridian cows, satisfy himself by masticatory experiment.

Linnaeus's account of the uses for which the *Angelica archangelica*, an allied plant, is employed by the Laplanders, applies in every respect to the *Heracleum*, which is used by the natives of some of the Hebrides in the same manner. He says it is held in great estimation in Lapland, the natives using it in place of fruit, of which they have none, with the exception of a few berries. The stem is stript of leaves, and the soft internal part, after the outer layer has been peeled off, is eaten raw like an apple or turnip. This kind of food, he says, was not disagreeable to him, for being slightly bitter, and at the same time aromatic, it formed an excellent seasoning to the fish, flesh and rein-deer milk which he commonly obtained, the natives making no use of salt.

Numerous plants occur in pasture grounds which are entirely rejected by cattle, and there are others, the eating of which is supposed to be injurious to them. Of the former kind are thistles, *Cnicus lanceolatus*, and *arvensis*; the bur-dock, *Arcium Lappa*; ragwort, *Senecio Jacobæa* and *aquaticus*; sea radish, *Raphanus maritimus*; meadow rue, *Thalictrum medium*; mugwort, *Artemisia vulgaris*; together with all the ligneous plants, as the *Ericæ*, *Calluna*, *Empetrum nigrum*, &c. Many of these plants might be extirpated from pasture grounds with

little difficulty at any season of the year, excepting spring. But the operation ought to be performed when they have shot up sufficiently to be easily extracted by the hand, and before they have formed their seeds. They might then be collected into heaps, and burnt, or deposited in the dunghil. There can be no doubt, that, by due attention to the extirpation of useless and noxious species, pasturages might be greatly improved in quality. The species which are supposed to be injurious to cattle, are those possessed of acrid or narcotic qualities. Of the former may be mentioned the *Ranunculus acris*, *Flammula* and *sceleratus*, which, probably, from their well-known acrid and epispastic qualities, are conceived to give rise to diseases of the intestinal canal. The tender herbage of spring is also frequently productive of diarrhœa in black cattle and sheep, which may be reduced to a dangerous state of weakness by too sudden a transition from the dry winter pasturage to one consisting entirely of the soft shoots of the richer and more nutritious plants. The abundant herbage of autumn, softened by the rains, and perhaps undergoing a partial decomposition, is also supposed to be a cause of braxy. It is certain, at least, that the removal of lambs from rich pasturage of this kind to moorland, operates beneficially upon them, when that epidemic prevails.

The value of a given extent of pasture-ground as a farm, for the rearing of cattle, depends no doubt principally upon the richness of the vegetation; but it also, in no small degree, depends upon a variety in the vegetation, and upon the degree of declination of the ground, and the shelter afforded by hills. Certain plants also, which are useless as food, are worthy of being preserved as affording shelter; of which kind are, in certain circumstances, the common heath, the broom and the brake. But such plants as rose-shrubs, brambles, gorse and the aloe, although they may afford shelter, ought to be extirpated, on account of their inclination to spread, the difficulty of restraining them within the desired bounds, and the injury which they inflict upon the fleeces.

Very little seems to have been done in this country for the improvement of natural pasturages; yet many varieties might be rendered greatly more productive by judicious management.

For example, how many sandy spots, in an incipient state of rebellion, might be effectually secured by the application of a few turfs or spadefuls of earth? How many bogs, totally unproductive of useful herbs, and dangerous to cattle, might be dried and rendered secure by a very slight ditch or drain? How many tracts of furze, rank heath or fern, might be cleared by the servants of an extensive farm, at periods of comparative cessation from labour, or of idleness? But, upon this subject, I am unable at present to enter. I cannot, however, avoid expressing regret, that the incumbents upon the numerous extensive grazing farms of the Highlands in particular, should in hardly any case direct their attention towards the improvement of their farms, conceiving all amelioration of this kind to find its proper object exclusively in the management of arable land. It would, indeed, be absurd to expect, that people should enter upon the task of shelving down the rugged slopes of mountains, or of filling up morasses; but, short of this, there is abundant occupation for hours of idleness, in the many minor operations to which a judicious management might give rise.

ESSAYS ON THE ORIGIN AND NATURAL HISTORY OF DOMESTIC ANIMALS. *By JAMES WILSON, Esq. F. R. S. E. M. W. S. &c.*

ESSAY III.

ON THE ORIGIN AND NATURAL HISTORY OF THE DOMESTIC OX,
AND ITS ALLIED SPECIES.

I PROPOSE, in this paper, to give a short account of the different species of cattle, which the skill and perseverance of man has enabled him to subdue in the various regions of the earth,—and to point out the probable source of those varieties which the European nations cultivate to such perfection, and with so many beneficial results. If the horse is the noblest and most majestic of man's conquests, and the dog the most interesting and companionable, the bull and cow yield not the palm of usefulness to either of their more spirited or sagacious rivals. Milk, but-

ter, cheese, tallow, and beef, are very necessary ingredients in the comforts and general economy of human life, to make no mention of leather and horn spoons.

The origin of our different breeds of domestic cattle, is a matter not easily explained. The soil and climate of a certain district seem more favourable for the production and continuance of one breed rather than another, and many of our local varieties have no doubt originated from such peculiarities of soil and climate, aided by the intelligence and activity of those whose interest it became to encourage and improve the most advantageous variety. Certain special qualities are, from local or accidental circumstances, more valuable in one country or even county than another; and these qualities are developed or decreased, in proportion to the estimation in which they are held. Colour is too superficial a character to have any (or much) influence on the natural or more substantial qualities of an animal—but it is easy to conceive, that, when a breeder becomes possessed of a breed of cattle remarkable for combining the best and most desirable qualities, he will naturally attach some importance even to colour, though not an influential attribute, and that, other circumstances being the same, he will prefer to continue the breed from those which resemble the original and esteemed stock in colour, as well as in size, form, and proportions. It is probably in this way that the characteristic breed of each district is so often distinguished by a peculiar colour, from that even of a neighbouring province. It would, indeed, be impossible to account for it otherwise, for we cannot conceive that the different kinds of our domestic cattle sprung originally from different species of wild animals.

All animals are created with certain internal characters or dispositions, and with certain external characters or aspects, and by whatever means they were enabled to discover, or were originally placed in those situations most adapted to the development and continuance of their respective or specific natures, it is evident, from the uniformity which prevails in the features of all wild animals of the same species, that local circumstances are not efficient in the production of natural changes; in other words, that to preserve the simplicity of nature species have been originally placed only in those situations which produce or

preserve a uniformity in the aspect of individuals, and an adherence to the characters of the *Adama*—the beautiful or first created of each kind. *

The more an animal is subjected to a mode of life different from that adapted to its original nature, the more will its characters become altered, and removed from those of its primitive state. The longer the period during which it has been subjected to the dominion of man, and the more constrained and artificial the conditions to which that subjection has rendered it amenable, the more striking will be the variation in its external aspect and colouring, and the greater its departure from the form and features of its primitive type. If we consider for a moment the infinite variety of circumstances under which our domestic animals are born and bred, and the wide differences which all these circumstances present, when compared with those under which a wild animal, even of the same species, would naturally be produced, we shall scarcely wonder either at the dissimilarities exhibited by the domestic breeds themselves, or their disagreement with the characters of any unreclaimed species.

The changes in the nature and instinct of animals, produced by their subservience to the will of the human race, is truly remarkable. "The empire which man has over animals," says Buffon, "is an empire which revolution cannot overthrow; it is the empire of the spirit over matter; a right of nature, a power founded on unalterable laws, a gift of God, by which man may at all times discern the excellence of his being, for he does not rule them because he is himself the most perfect, the strongest, or the most dexterous of animals. If he held only the first rank of the same order, the others would unite to dispute his empire; but it is from the superiority of his nature that man reigns and commands: he thinks, and for this reason is master over beings that are incapable of thinking. He reigns over material bodies, because they can only oppose to his will a sullen resistance, or an inflexible stupidity, which he can always

* Ludolphus (*Hist. Ethiop.*) traces the name of *Adam* to the Ethiopian root *adama*, pleasant or beautiful. According to Bryant, *ad* and *ada* signify first or earliest.

overcome by making them act against each other. He is master of the vegetable creation, which by his industry he can augment, diminish, renew, multiply, or destroy. He maintains a superiority over brutes, because, like them, he not only has motion and sensation, but is endowed with the light of reason, by which he governs his actions, concertis his operations, and overcomes force by cunning, and swiftness by perseverance. Nevertheless among animals some appear familiar, others savage and ferocious. If we compare the docility and submission of the dog, with the cruelty and ferocity of the tiger, the one will appear to be the friend of man, the other his enemy: his empire, then, over animals is not absolute. We must distinguish the empire of God from the domain of man: God, the Creator of all beings, is the sole Master of Nature. Man has no influence on the universe, the motions of the heavenly bodies, nor the revolutions of the globe which he inhabits; over animals, vegetables, or minerals, he has no general dominion; he can do nothing with species, his power only extends to individuals; for species in general, and matter in the gross, belong to, or rather constitute nature. All things pass away, follow, succeed, decay, or are renewed by an irresistible power. Man, dragged on with the torrent of time, cannot prolong his existence: his body being linked to matter, he is forced to submit to the universal law; he obeys the same power, and, like the rest, comes into the world, grows to maturity, and dies. But the divine ray with which man is animated, enables and raises him above all other material beings. This spiritual substance, far from being subject to matter, has the power of making it obey; and though it cannot command all nature, it presides over particular beings. God, the sole source of all light and understanding, rules the universe and the species with infinite power; Man, who possesses only a ray of this spiritual substance, has a power limited to small portions of matter and individuals.*

The influence and authority of man, is probably greater than Buffon supposes. The domestication of the dog, which, in a former essay, (see vol. i. of this *Journal*, p. 539,) we endea-

* Buffon.

voured to show was principally descended from the wolf,* demonstrates the power of the human race over even a strictly carnivorous animal—and the subjugation of the common cat is another equally familiar example, which might have reminded the great French naturalist that it was not the ruminating and herbivorous animals alone which had become subservient to the will of man. The last named quadruped (and, among birds, domestic poultry illustrate the same point,) also proves, that man in some instances has subdued not the individuals alone, but the entire species—for there are several of our domestic animals, of which the personal researches of travellers, and the learning and ingenuity of naturalists, however assiduously exerted, have as yet sought in vain to discover the original sources. From this we cannot positively infer that they are extinct, but we may fairly infer, that if they exist at all they must occupy some remote and unknown corner of the earth, and be very unimportant compared with the greatly preponderating mass of individuals which now dwell under the fostering care of man, and may be said really to constitute the species.

Buffon appears to have admitted of only two kinds of cattle, the bull and the buffalo. A wild bull, the source of all our domestic breeds, synonymous with the Aurochs of Europe, with the Bison of America, and the Zebu of Africa, and of Asia, were all regarded by him as varieties of one and the same species, produced by climate, food, and domestication. The humped backs of the Bison and Zebu, according to the imaginative views of the eloquent Frenchman, were signs of slavery produced by grossness and excess of feeding, and he sought to escape the dilemma presented by the existence of wild cattle with humped backs, by at once asserting, that these were either an emancipated tribe, originally descended from an enslaved and deteriorated race, or constituted in themselves a natural variety

* In the eighth number of my "*Illustrations of Zoology*," (Plate 29.) I have given a figure of the Grey American Wolf brought to this country by Dr Richardson. An inspection of that figure will demonstrate the near alliance between the wolf in the wild state, and certain northern varieties of the domestic dog.

of which the hump was characteristic.* According to the same authority, it was a humped variety, which, passing from the north of Europe or Asia, to the American Continent, gave rise to the Bison breed of that country,—a theory which he thinks strongly confirmed by the fact, that both the Aurochs of the Old World, and its representative in the new, smell strongly of musk!† So confused were his notions in many respects concerning these animals, that he appears to have confounded the Bison and the musk ox, although Charlevoix, and other travellers to whom he had access, had previously described the difference in their external characters, as well as in their haunts and habits. In regard to their geographical distribution, he advances the dwelling-places of the Bison almost to the Pole itself, whereas, in reality, the musk-ox only is found there; and then forgetting what he had just before stated, he locates the race of Aurochs in the frigid zone, and restricts the Bison to the temperate; while he draws the general conclusion, that all domestic cattle without humps are descended from the former, and all humped cattle from the latter.

* “La variété la plus générale et la plus remarquable dans les bœufs domestiques et même sauvages, consiste dans cette espèce de bosse qu’ils portent entre les deux épaules : on a appelé Bisons, cette race de bœufs bossus, et l’on a vu jusqu’ici que les bisons étoient d’une espèce différente de celle des bœufs communs : mais comme nous sommes maintenant assurés que ces bœufs à bosse produisent avec nos bœufs, et que la bosse n’est qu’un caractère accidentel et variable que n’empêche pas que le bœuf bossu ne soit de la même espèce que notre bœuf. Or, on a trouvé autrefois dans les parties désertes de l’Europe des bœufs sauvages, les uns sans bosse et les autres avec une bosse.” “Il y a donc dans les variétés de ces animaux, sous les différents climats, deux races primitives toutes deux anciennement subsistantes dans l’état de nature, le bœuf à bosse ou Bison, et le bœuf sans bosse ou l’Aurochs. Ces races se sont soutenues soit dans l’état libre et sauvage, soit dans celui de domesticité, et se sont répandues ou plutôt ont été transportées par les hommes dans tous les climats de la terre : tous les bœufs domestiques sans bosse viennent originairment de l’Aurochs, et tous les bœufs à bosse sont issus du Bison.”—Buffon, t. 5, pp. 88–89, Bernard’s edition.

† “Ce qui confirme et prouve encore l’identité d’espèce du Bison et de l’Aurochs, c’est que les bisons ou bœufs à bosse du nord de l’Amérique ont une si forte odeur qu’ils ont été appelé bœufs musqués par la plupart des voyageurs, et qu’en même temps nous voyons par le témoignage des observateurs, que l’Aurochs ou bœuf sauvage de Prusse et de Livonie a cette même odeur de musc, comme le bison d’Amérique.”—Buffon, t. 5, p. 100.

Pallas, in the 2d volume of the Petersburg Transactions (*Act. Petrop.*), enters into a detailed statement of facts regarding the natural history of the aurochs, the bison, the musk-ox, and the yacks, or grunting-ox of Pennant and Dr Shaw,—thus admitting, in the first place, the existence of four distinct species. In this enumeration he errs, in so far as he confounds the European and American bisons as one and the same. He refutes the mistake committed by Buffon in supposing that the aurochs of Europe consisted of two varieties, the urus and the bison. The last named author was probably drawn into error by following the sentiments of some ancient writers, for example Pliny, and by the old German word *bisem*, signifying the musky odour of the aurochs, and no doubt latinized in the term *bison* *. But while Pallas freely admitted that neither the aurochs nor the bison existed throughout the whole extent of Northern or Middle Asia, he nevertheless persisted with Buffon, that the aurochs and the true American species were identical, and were merely altered in their respective localities, by the difference of climatic influences. He asserts the probability of their having passed from Europe to America, when these continents were connected by vast and continuous tracts of land, of which the shattered and sunken debris are still represented by the snow-covered mountains of Iceland, and the isles of Shetland and Feroe. He regards the aurochs as the real and original source of our domestic breeds of cattle. The result of his inquiries indicates, that according to his views our domestic cattle and the aurochs and bison are the same, while the musk-ox, the grunting-ox (yacks), and the Asiatic and African buffaloes, are distinct from those just mentioned, and from each other.

It appears, then, that prior to the time of Cuvier, the larger kinds of horned cattle were considered as amounting to five in number, so far as regarded living species. In the *Dictionnaire des Sciences Naturelles*, Cuvier distinguishes eight species. He separates the aurochs from the bison, and establishes two additional species, the *arnée* of Asia, and the domestic bull, the source of which he traces, not to the aurochs, of which the number of the ribs, the occipital arch, and the inter-orbital distan-

* *Dict. Class. d'Hist. Nat.* t. ii. p. 360.

ces of the forehead, are dissimilar, but to a fossil species (probably extinct in the living state), the bones of which occur in various alluvial soils of Europe, and of which the dimensions equal those of the great fossil buffalo discovered by Pallas in Siberia.

No species of cattle has ever been found in a truly wild condition in any part of South America. Neither have their remains occurred on that continent, even in a fossil state. In North America, on the contrary, on this side of the Tropic of Cancer, two species occur,—the bison or buffalo of the Anglo-Americans, and the musk-ox (of the Arctic Regions) which recent systematic writers have formed into a separate genus, under the name of *ovibos*. The distinguishing characters of the American bison consist in its possessing fifteen pair of ribs, and being comparatively much feebler in the hinder than the anterior extremities—characters of more essential importance in the distinction of species, than the size and direction of the horns, or the texture and colour of the external coat. As far, however, as the nature of the hair is concerned, there exists a decided difference between the aborigines of the New World, and the species of Europe and Asia, viz. the coat of the former is woolly, and their hides, like those of the musk-ox, are of a more spongy nature than those of the aurochs and European oxen. The American bison appears to inhabit from about the 40th degree of north latitude to the vicinity of the polar circle, beyond which its place is occupied by the musk oxen (*B. moschatus*).

The northern provinces of Asia produce neither the aurochs, the buffalo, nor the bison, nor is there any proof that they ever existed in these territories; for the fossil skulls which are found there seem to belong to an extinct species, which, in former times, inhabited both Europe and Asia. Its remains are found with those of the fossil elephant and rhinoceros, from which it may be inferred to have been not contemporaneous with the other species, for, had it been otherwise, their bones would have been found together. The skulls analogous, but so superior in size, to those of our domestic breed, are, on the contrary, contemporaneous with the actual conditions of animal life, for they

occur in soils or superficial strata, the formation of which is going on at the present time *.

As some of the readers of this Journal may not be sufficiently acquainted with the subjects of Natural History to admit of their forming any very precise ideas in connexion with the terms or specific appellations which we make use of, we shall, before proceeding further, present an abridged view of the synonyms, characters, and localities, of the principal species of the genus *Bos*, chiefly in accordance with the latest arrangement with which we are acquainted—that of Baron Cuvier, as exhibited in the recent edition of the *Règne Animal*, (1829) †.

1.—THE DOMESTIC BULL AND COW.

(*Bos Taurus*, PLINY, GESNER, ALDROVANDUS. *Bos Taurus*, domesticus, LINNÆUS, &c.)

The most permanent and substantial specific characters of this animal may be stated as follows:—Forehead flat, longer than broad, horns round, placed at the two extremities of a projecting line, which separates the front from the occiput. Ribs amounting to thirteen pair. Teats disposed in the form of a square. Hair of the anterior parts of the body not more bushy than that of the other parts. The supposed original of this animal (the *urus* of the ancients) is probably extinct in the living state. In the fossil skulls which appear to represent it, the horns are curved forwards and downwards, but in the countless varieties of the domestic breed, these parts are very different in their forms and direction, and are sometimes wanting altogether. The ordinary races of the torrid zone are generally distinguished by a hump or large excrescence of fat and flesh upon the shoulders. The species does not occur naturally in either North or South America.

2.—THE AUROCHS OF THE GERMANS.

(Called *Zubr* in Poland. *Bos Urus* of GMELIN. The Bison of the ancients. The European Bison of SHAW, *Gen. Zool.* pl. 205. *Bos Taurus*, var. *Urus*, LINN. *Bauf Aurochs*, DESMAREST.)

This species has been frequently, though erroneously, regarded as the origin of our domestic cattle. It is distinguished by

* *Ossements Fossiles*, t. iv. *Dict. Class. d'Hist. Nat.* t. ii. p. 361.

† Eight distinct species of bovine animals are there described, including the musk ox. The *arnée* of Asia is not admitted.

its bulged or convex forehead, which is, moreover, broader than high, by the peculiar attachment of the horns *below* the line of the occipital ridge, by an additional pair of ribs (fourteen), by a sort of frizzled wool, which covers the head and neck of the male, and forms, as it were, a beard or small mane upon the throat, and by a peculiarity in the tone and utterance of its voice, which, to use the convenient language of the novelist, is "more easily imagined than described." This is a wild and independent animal, which is now confined to the marshy forests of Lithuania, of Carpathia and the Caucasus, but formerly inhabited the temperate parts of Europe. It is the largest of all the quadrupeds native to Europe, and measures six feet in height at the shoulder, and betwixt ten and eleven feet in length, from the nose to the insertion of the tail. According to Gilibert, it surpasses the dimensions of the largest of the Hungarian bulls. The length of the mane in the female is not more than the fourth part of that of the male. In both sexes, the lips, gums, palate, and tongue, are blue, and the last mentioned part is very rough and tuberculated. The horns are black, and thicker and more compact than in the domestic bull. Certain parts of the hide smell decidedly of musk, especially during the winter season, and the name of bison has no doubt been bestowed upon it in consequence of that peculiar odour—the German word *wisen* or *bisem* signifying musk. The name of aurochs, by which it is now designated, is probably synonymous with the Latin *urus*, originally applied to another species.

Gilibert had an opportunity of observing the manners of four young bisons, which were taken during the month of January in the forest of Bialowiezenski. They refused to suck a cow, but were at last induced to receive nourishment from a she-goat, raised on a line with their muzzles, by being placed upon a table. As soon as they were satisfied, they sometimes tossed both nurse and table by a blow of their heads to the distance of six or eight feet. The two males died after the lapse of a month. On the termination of the first year, the small manes of the females had made their appearance. They became in season at the age of two years, but refused the approaches of the domestic bull with the greatest indignation. In other respects,

they were docile and obedient, caressed their keeper by licking his hands, or rubbing his body gently with their heads and muzzles, and came to him when they heard his voice. They detested the colour of scarlet, and drove all the domestic cows from their pastures. The female is said to carry her young eleven months. Judging from the appearance of those described by Gilibert, it might be inferred that they had been produced in the month of December. Now Herberstein states, that the thur or real urus produces its young in spring, and that such as are born in autumn rarely survive. This circumstance may be regarded as an additional support to that theory which maintains that our domestic breed has descended rather from the latter animal than from the aurochs or European bison.

3.—THE AMERICAN BISON.

(*Bos Bison*, LINN. *Bos Americanus*, GMELIN. Buffalo of the Anglo-Americans, and of CATESBY's *Carolina*. American Bison, SHAW. *Gen. Zool.* pl. 206.)

According to Raffinesque, this bison has been domesticated in parts of Kentucky and the Ohio*. It is reported by some authors to have bred with the tame cow of European origin, and the cross breed is said to continue prolific. But this statement requires confirmation. "Our inquiries on the spot," says Major H. Smith, "never produced a proof, or even an assertion, from the well-informed, that they had seen the hybrid offspring."

The head of the species resembles that of the preceding, and the anterior portions of its body are, in like manner, covered by a curled woolly hair, which becomes excessively long during the winter season; but its legs are shorter, its hinder extremities comparatively weaker, and its tail not nearly so long. It is said to have fifteen pair of ribs. It inhabits a great extent of territory throughout the temperate and northern parts of North America, and its history will be found pretty fully detailed in the works of Warden, and other recent writers.

* I state this on the authority of M. Antoine Desmoulins, not having perused the work of the writer above referred to.

4.—THE BUFFALO.

(*Bos bubalus*, LINN. *Le Buffle*, BUFFON. *Arachosian Ox* of ARISTOTLE.)

The forehead of the buffalo is convex or bulging, longer than broad, the direction of the horns is lateral, and they are marked in front by a longitudinal projecting ridge. This animal is a native of India, from whence it was brought into Egypt and Greece. It was introduced into Italy about the close of the sixth century *; and numerous herds now graze among the Pontian Marshes. Its milk is excellent, its hide very strong, its flesh but slightly esteemed †.

5.—THE GAYAL.

(*Bos Gaurus*, MAJOR SMITH, in Griffith's *Animal Kingdom*. *Bos frontalis*, LAMBERT, Linn. Trans.)

Nearly of the size and shape of an English bull, with a dull heavy appearance, but in reality almost equal in strength and activity to the wild buffalo. Horns short, distant at their bases, and rising in a gentle curve directly outwards and upwards. From the upper angles of the forehead proceed two thick, short, horizontal processes of bone, covered by a tuft of light-coloured hair. On these are placed the horns, which are very thick at the base, and slightly compressed, the flattened sides being towards the head and tail. The dewlap is covered with strong longish hair, so as to join a kind of mane on the lower part of the neck; but this is not very conspicuous, when the animal is young. In place of a hump, the gayal has a sharp ridge, which runs along the hinder part of the neck, shoulders, and anterior portion of the back. Inhabits the mountain forests to the east of Burrampootra, Silhet, and Chatgoon. The milk is very rich, though neither abundant nor lasting. The gayal is venerated by the Hindoos. It is domesticated in India. The female has

* "Tunc (A. D. 596) primum *Bubali* in Italiam delati, Italiae populus miracula fuere." Paul Warnef. l. iv. c. 2.

† "En allant de Rome à Naples on est quelquefois regalé de buffles et de corneilles, et encore est-on tout heureux d'en trouver; le buffle est un viande noire, puante et dure; il n'y a guère que les pauvres gens ou les Juifs de Rome qui aient accoutumé d'en manger."—*Voyage de Misson*.

been known to produce with a common Zebu bull of the Deswali breed.

6.—THE YACK.

(*Bos grunniens*, PALLAS. *Grunting Ox* of SHAW and PENNYANT. *Sorra Goy* of the Hindostanese. *Bos Poëphagus*, HAMILTON SMITH.)

Occiput convex, and covered with frizzled hair; horns round, smooth, pointed, lateral, bending forwards and upwards; withers very high, but not so decidedly hunched as in the zebus, mammae four, placed *transversely*; ribs fourteen pair; hair on the neck and back, very woolly, whitish and black; tail with very long hair. Sometimes hornless. This species (the *Poëphagus* of Ælian) inhabits the mountains of Central Asia. The *horse-tails*, as they are commonly called, used as standards by the Persians and Turks, are, in fact, made of hair (usually died a fine crimson) from the tail of the grunting-ox. The *chowries*, or fly-drivers, employed in India, are composed of the same materials. This species is domesticated by the Calmucks, the Mongolians, and other Tartar tribes. These cattle, though not large boned, look very bulky, from the vast quantity of long hair with which they are covered. They have a downcast heavy look, are sullen and suspicious, and usually exhibit considerable impatience at the near approach of strangers. Though not employed in agriculture, they are strong and sure-footed as beasts of burden, and are capable of carrying great weights. "In India," says Mr Turner, "no man of fashion ever goes out or sits in form at home, without two *chowrabadars*, or brushers attending him, each furnished with one of these tails mounted on silver or ivory handles, to brush away the flies. The Chinese die them of a beautiful red, and wear them as tufts to their summer bonnets*."

There is a curious though exaggerated account given of this animal by old Conrad Gesner, which the reader will find quoted in the note below †.

* *Account of an Embassy to Thibet.* In the work above quoted the Yack is figured under the name of the *Bushy-tailed Bull*. See plate x. page 186.

† "There is a beast in India called Poëphagus, because he feedeth upon herbs and grass like a horse, whose quantity he doth exceed double, for he is twice as big, his tail is most thick and black, the hairs whereof are thinner

7.—THE CAPE BUFFALO.

(*Bos Caffor*, SPARMANN.—Qu' *Arako* of the Hottentots.)

This species is distinguished by dark rufous horns, spreading horizontally over the summit of the head, with the beams bent down laterally, and the points turned up. They are from eight to ten inches broad at the base, and divided only by a slight groove, extremely ponderous, cellular near the root, and five feet long, measured from tip to tip along the curves*. Hide

than the hairs of a man's head: and, therefore, Indian women make great account of them, for with them they bind up their own hair, plaiting it, and folding it in a curious manner; every hair is two cubits in length, and upon one root twenty or thirty of them grow together. This great beast is one of the fearfulest creatures in the world; for if he perceives himself to be looked at of any body, he taketh him to his heels as fast as he can go; and yet although his heart be light, his heels be heavy, for, saith my author, *Magis studios quam celeriter fugam peragit*; that is, He hath a good will to run apace, but cannot perform it. But if he be followed upon good swift horses, or with nimble dogs, so as he perceiveth they are near to take him, and he by no means can avoid them, then doth he turn himself, hiding his tail, and looketh upon the face of the hunter with some confidence, gathering his wits together, yet in fearful manner, as it were to face out his pursuer or hunter, that he had no tail, and that the residue of his body were not worth looking after; but while he standeth staring on his hunter, another cometh behind him, and killeth him with a spear, so they take off the skin and tail, and throw away the flesh as unprofitable, for the other recompense their labour for their pains. Volterrannus relateth this a little otherwise, and saith that the beast biteth off his own tail, and so delivereth himself from the hunter, knowing that he is not desired for any other cause." The preceding account seems chiefly borrowed from Oelian. What follows, coincides with the narrative of Æneus Silvius. "Nicolaus Venetus, an Earl, writing of the furthest part or province of Asia, which he calleth *Macinum*, and I think he meaneth *Serica*, because he saith it lyeth betwixt the mountains and India and Cathay, there are a generation of white and black oxen, which have horses tails, but reaching down to their heels, and much rougher. The hairs whereof are thin as the feathers of flying birds, these, he saith, are in great estimation; for the knights and horsemen of that country do wear them upon the top of their lances and spears for a badge or cognizance of honour, the which I thought fit to be remembered in this place, because I take them to be either the same with these Indian beasts, or very like unto them."—*The History of Four-footed Beasts and Serpents. Collected out of the Writings of Conrad Gesner, and other Authors.* By Edward Topsel: London, folio, 1658.

* Griffiths' *Animal Kingdom*, vol. iv. p. 384.

black, almost naked, especially in old animals. Tail naked, furnished with an elongated tuft of bristles at the end. Lives in families or small herds in the brushwood and open forests of Caffraria. Sparmann and Professor Thunberg have published striking accounts of the strength and ferocity of these animals. Like the Buffalo, Aurochs, and others of the genus, they are capable of being excited almost to madness by any thing of a red colour. They swim with force and agility.

Several other species and varieties have been described by travellers and zoological inquirers; but those above enumerated will suffice for our present purpose.

It is a common, though an erroneous opinion, in this country, and one not seldom expressed with confidence by English writers, that our domestic cattle are derived from the European Bison. "There is, I believe, no doubt," says Mr Bingley, "that the ox is a descendant of the Bison, a large and powerful animal which inhabits the marshy forests and vales of Poland and Lithuania. In the lapse of many centuries, however, its general appearance, as well as its temperament and disposition, have undergone a radical change. The enormous strength of the body, great depth of chest and shoulders; the shagginess and length of hair which covers the head, neck, and other fore parts of the Bison, as well as his savage and gloomy disposition, are, in the present animal, so altered, that the mere variety would almost seem to constitute a distinct species *."

This mistaken view of the subject has arisen in a great measure from our being ignorant or forgetful of the characters which distinguish the real Urus from the Bison, and from the circumstance of the name of *Aurochs* having, for some centuries, been applied to the latter animal, although it was originally used to designate the former alone.

Herberstein † and Martin Cromer ‡ assert that the name of Bison is always bestowed on the animal called Zubr or Zumbur by the Poles; that the name of Aurochs or Urus is improperly bestowed upon it by the Germans; that these last mentioned

* *Bingley's British Quadrupeds*, p. 391.

† *De Lithuania*, cap. li.

‡ *De Situ Polonia, et Gente Polonica*.

names apply solely to the urus or *Thur* of the Polish nation ; and they add, that the *thur* was at that period found only in Masovia, near Warsaw ; and they even name the particular villages the inhabitants of which were charged with its conservation. During their days, the *thur* or wild bull appears to have been kept as a curiosity*, as the *zubr* or modern *urochs* is at this day †. Anthony Schneebergen designates by the name of *Thur* a species of wild bull, differing from the domestic breed in few particulars, except its greater size, the uniformly black colour of the males, and the beauty of its coat ; its horns were always directed forwards. † This last character excludes the identity of the *thur* and buffalo presumed by Pallas. The forward direction of the horns, the greater size, the similarity of form to that of the domestic bull, all established and described by observers who were at the same time sufficiently familiar with the *zubr* or modern *urochs*, prove it to have been a different animal from that last named.

That the *thur* or urus, as distinct from the *zubr*, was not to be confounded with the buffalo, might have been clearly manifested from the writings of Julius Caesar Scaliger, who describes the latter animal with as great correctness as any of the modern zoologists ‡. Albertus Magnus had indeed given its characters two centuries before. That Herberstein could not have mistaken the buffalo for the supposed urus, becomes more probable from the circumstance of his having travelled through Italy and Greece. J. C. Scaliger had himself seen the horns of the urus (or *thur*), and described them as differing in nothing from those of some domestic bulls ; and he mentions the uses to which they were put as drinking vessels, as his namesake Julius Caesar (the passer of the Rubicon) had done of old in his account of the Gauls. Aldrovandus states that the horns of the urus were much longer than those of the bison, and of another colour. According to Gesner, very large crania of

* “ *Uros sola Masovia, Lithuanie contermina habet ; quos ibi patrio nomine Thur vocant ; non est magna eorum copia ; suntque certi pagi, quibus cura et custodia eorum incumbit nec fere aliter quam in vivantiis quibusdam servantur.*”—Herberstein, *De Rebus Muscovicis Comment.*

† Gilibert, *Esscrit. Phytolog. Zool.*

‡ *Esscrit. Esoteric. 206. ad Cardan.*

wild bulls had been attached to some public buildings at Mayence several centuries before his time, and were still observable there. Those of our own Warwick Castle were described at that same early period by Dr Caius, whom Edward Topsel lauds as “that excellent physitian in England, John Cay*.”

It appears from the preceding accounts, and many others which might be brought forward, that the urus or thur bore a much closer resemblance to our domestic breed of cattle, than do either the modern aurochs (commonly called the European Bison) or the buffalo, and that it is identical with the great fossil bull of Europe, and with the ancient urus or wild bull of Cæsar. It appears to have become almost extirpated during the middle ages, in consequence of the progress of civilization among the western nations, and had ceased to exist in a living state about the fifteenth century, except in certain royal forests of Poland; whereas the aurochs or bison existed in such preserves (as for example in the woods of Bialowiezenski) in Lithuania, so late as the year 1778 †.

The following is a summary of the geographical distribution of the principal species of wild cattle. There are two species proper to North America—the Musk Ox (*B. moschatus*), which dwells within the polar circle, and the Bison or American Buffalo (*B. Americanus*), which inhabits from that circle southwards till between the 40th and 85th degrees of north latitude. There are two species characteristic of Europe—the Aurochs or European Bison (*B. Bison*), called Zubr by the Poles, and the genuine Bull (*B. Taurus*), the Thur of the middle ages, and Urus of the ancients, now extinct in the wild state. There are at least four species found in Asia—the Yack or Grunting-Ox (*B. grunniens*)—the common Buffalo (*B. bubalus*)—the Arnee (*B. arnæe*)—and the Gayal (*B. gavæus*). There is only one well determined species peculiar to Africa, the Cape Buffalo (*B. caffer*) ‡.

* See the *Relation of John Cay, a Doctor of Physick in England*, published in Topsel's old folio volume, p. 43.

† *Dict. Class. d'Hist. Nat.* t. ii. p. 362.

‡ For the other species, whether doubtful or ascertained, as well as for many interesting particulars connected with the history of those above enumerated, see the memoir by Major Hamilton Smith, inserted in the 4th volume of Griffiths' *Animal Kingdom*.

In relation to the localities of species, it thus appears that the zone inhabited by the genus *Bos* stretches obliquely across all climates; and that each species, with the exception of the bull and the buffalo, now widely dispersed from their original centres through the dominating influence of man, is confined within certain circumscribed limits, in which it is retained, as well by natural barriers as by instinctive inclination. The difference in the habits of life observable between the American and European bisons, would, of itself, suffice to establish the specific distinction of these animals. Had they been identical, the aurochs, or European species, would have preserved in America that love of retirement which induces it to dwell in the central solitudes of forests, where (in that of Hercynia) it was found in the days of Cæsar, as it now is in those of Lithuania and the Carpathian Mountains. The American bison, on the contrary, congregates in large troops, and delights to dwell in those open plains or prairies which produce a thick and abundant pasture. The musk ox, without avoiding such stunted forests as the sterile regions to which it is native are capable of producing, yet dwells for the greater part of the year among the rocky and almost ice-covered countries of the extreme north, "creating an appetite under the ribs of death," with little wherewithal to appease that appetite after it is created. The Buffalo (of Asiatic origin) is an animal of almost amphibious habits, fond of the long, coarse, rank pasture which springs up in moist and undrained lands. Hence its love of the Pontian marshes, where, according to Scaliger, it will lie for hours submerged almost to the very muzzle—an instinctive habit which it exhibits equally in Timor, where it was more recently seen to indulge its aquatic propensities in a similar manner by Dr Quoy of the *Uranie* *. The Yack inhabits elevated ranges, and the cool and lofty table lands of central Asia. The Buffalo of the Cape, in this respect resembling the aurochs, prefers the dense forests of Southern Africa, though, in the form and volume of its horns, it in some degree coincides in character with the musk ox, located under a different and very distant clime. All these species, then,

* "They are so fond of the water, that I have seen them continue in it a whole day. It often happens, that the water which is fetched from the Nile, near its banks, has contracted their musky smell."—Sonnini's *Travels*.

with the exceptions above stated, may be regarded as the aborigines of the countries where they now occur. And the urus, or wild bull of ancient authors, may, I think, be reasonably regarded as the origin of our domestic kinds, and it may also be now considered as extinct, at least in Europe. Although we cannot trace it to these temperate regions of Asia, where the human race is supposed to have had its creation and increase, and where probably all those species which man had contrived to subjugate at an early period of his own career, must likewise have been originally placed, yet its early absence from those countries where mankind, in a state of civilization, first became the dominating power, is a circumstance in no way unconformable with the natural progress of events, or indeed with the almost “invariable sequence” observable in the history of all wild animals of the larger and more unwieldy kinds, when their native boundaries become encroached upon, and consequently circumscribed or intersected by the human race.

The fossil species, or that of which the bones only are found in peat-mosses and marshy grounds, corresponds in its gigantic dimensions to the uri described by Cæsar (no doubt with circumstances of exaggeration), which were little inferior in size to elephants—“Uri sunt magnitudine paulo infra elephantos.” A smaller species, also, or individuals of a smaller race, occur fossilized in the Cornish mines, and exhibit a form of horn rarely exemplified in the domestic breeds, but in part retained by the wild cattle of Scotland, and other emancipated or half-reclaimed tribes. Barba Cuvier has brought forward the evidence of Gregory of Tours to prove the existence of wild bulls among the mountains of the Vosges in the reign of Gontram, and a passage in the poet Fortunatus, where Gogon, the first known Maire of the Palace of Austrasia, is represented hunting these animals, proves their existence in Ardennes. They are likewise mentioned as distinct from the bison (wisend) in the *Niederhungen*, according to the verses adduced by Professor Goldfuss, in illustration of another point of natural history, where the hero Sifrid is made to slay a bison, an elk, four uri, and a

† Consult Desmoulin's *Mémoire sur la Distribution géographique des Animaux Vertébrés, moins les Oiseaux*; Journal de Physique, Février 1822.

schelch *.) We have already referred to the latest accounts of the living urus, that given by Herberstein, who states that they existed in his time, probably in a half-reclaimed state, in certain parts of Muscovy. . . We must now, however, come nearer home, and inquire, though briefly, into the history of our British cattle. Their original introduction into this island is neither known in history, nor asserted in tradition. Whether they were derived from abroad, or were descended from wild individuals of the urus race, native to this island in former ages, is a question which the lapse of time will not disclose, but rather involve in additional obscurity. . . It can scarcely be doubted, that the original domestication of the ox was effected in western Asia, by one or other of the Caucasian nations, and that such domestication was a principal cause of the civilization which their descendants carried to the westward and south-east, "where the genuine taurine races, not multiplying or yielding equal returns to human industry and human wants, have caused the veneration in which they are held, and necessitated the prohibition of feeding on their flesh. It is to these circumstances, also, that we may refer the domestication of the buffalo, whose strength and habit was suited to supply the deficiencies of the ox; and a similar effect has since operated in Egypt, for, since the introduction of the buffalo into that country, domestic cattle are not only fewer, but far from deserving the commendations bestowed upon them by the ancients."

The climate of the British isles is, beyond most others, productive of a great variety in the nature of our pastures, and of a corresponding variety in the aspect and condition of such animals as depend upon those pastures for their support. Cæsar mentions the numbers of the British cattle, and adds, that we (or rather the then inhabitants, for we of the present

* "Der nach schluch er schiere einen Wient und einen Elch, Starcher Ure viers, und einen grimmen Schelch."

I may observe, *en passant*, that the *Schelch*, which in the preceding rhymes is named as another animal than the elk, must, in all probability, have been the great moose deer or elk of Ireland and the Isle of Man, now only known in the fossil state, and of which so fine an example is preserved in the Edinburgh Museum.

day are a cross-breed) lived on milk and flesh, to the neglect of tillage. Strabo praises our abundance of milk, but accuses us of being ignorant of the art of making cheese. "Delaps" were unknown in those remote and barbarous times. According to Mela, cattle constituted the true wealth of the Britons; and the same author states, that such was the richness of the Irish pastures, that the cattle of the "Green Isle" would burst, if suffered to feed for too long a time.

This preference of a pastoral life over one of tillage, on the part of our British ancestors, was handed down to a much later period, and may be said to have prevailed during the continuance of our own feudal government. "The chieftain, whose power and safety depended on the promptness of his vassals to execute his commands, found it his interest to encourage those employments that favoured that disposition; the vassal, who made it his glory to fly at the first call to the standard of his chieftain, was sure to prefer that employment which might be transacted by his family with equal success during his absence. Tillage would require an attendance incompatible with the services he owed the baron; while the former occupation not only gave leisure for those duties, but furnished the hospital board with ample provision, of which the vassal was equally partaker. The relics of the larder of the elder Spencer are evident proofs of the plenty of cattle in his days; for, after his winter provisions may have been supposed to be mostly consumed, there were found, so late as the month of May, in salt, the carcasses of no fewer than 80 beeves, 600 bacons, and 600 muttons. The accounts of the several great feasts in after times, afford amazing instances of the quantity of cattle that were consumed in them. This was owing partly to the continued attachment of the people to grazing, partly to the preference that the English at all times gave to animal food *."

I shall not, in the present communication, enter upon the history of those numerous varieties of our domestic cattle which have rendered our breeds the most varied and remarkable in the world, and have long yielded us as good beef (of which the very name is almost identified with the character and propensi-

* *Encyclopædia Britannica*, 6th ed. vol. xii. p. 520.

ties of the nation) and as rich and abundant dairies, as any in Europe. Their history ought to form a separate subject by an abler and more experienced hand *. In the mean time, I shall proceed to make a few observations on our wild white cattle, generally regarded in this country as a remnant of the original stock, from which all the others have been derived. That this breed, whether the genuine original or an emancipated tribe, existed in Britain at a very remote period, and has continued in a tolerably pure and unmixed condition, admits of little doubt. Fitz-Stephen, who lived in the twelfth century, speaks of the *Uri sylvestres*, which in his time inhabited great forests in the vicinity of London. At a later period (fourteenth century) King Robert Bruce was nearly slain by a wild bull, which attacked him "in the Great Caledon Wood," but was rescued by an attendant, "whom he endued," says Holinshed, "with great possessions, and his lineage is to this day called of the Turnbulla, because he overturned the beast, and saved the king's life by such great prowess and manhood †."

* For excellent representations of the different varieties of our subjugated quadrupeds, I beg to refer the reader to a work entitled "*British Domestic Animals*," now in the course of publication, by Mr Wight, from original drawings by Howe, the best animal painter Scotland ever produced. The plates are engraved by Mr Lizars, at whose office, I believe, the work may be obtained.

† The following is a more detailed account of this adventure :—"In Strivelingsheire is the town of Striveling; and above it standis the castel under the samin name, sum time namit the Dolorus Montane. At this toun began the Gret Wod of Calidon. This wod of Calidon ran fra Striveling, throw Menteith and Stratherne, to Atholl and Lochquhair; as Ptolome writtis in his first table. In this wod wes sum time *quhit bullis*, with crisp and curled mane, like feirs lionis; and, thought they semit meik and tame in the remanent figure of their bodyis, they wer mair wild than ony uthir beistis; and had sic hatrent aganis the societe and company of men, that they come never in the woddis nor lesuris quhair they fand ony feit or hand thairof; and, mony dayis efter thay eit nocht of the herbis that wer twichit or handillitt be men. Thir bullis wer sa wild, that thay wer nevir tane but sticht and crafty laubour; and sa impacient, that, efter thair taking, they deit for importable doloure. Als soon as ony man invadit thir bullis, they reuchit with so terrible preis on him, that they dang him to the eird, takand na feir of boundis, scharp lancia, nor uthir maist penitrive wappania. It is said, King Robert Bruce, efter his coronation, went to ane hunting in this wod, havend bot ane quiet cumpanie with him, and eschapit narrowlie of his lief; for ane of the bullis, efter that he wes sair woundit be the huntaris, ruschit feirsle

The same animal is alluded to by Conrad, Gesner; in the sixteenth century, in the following terms :—" In the woods of Scotland, called Callender, or Caldor, and in ancient times Caledonia, which reacheth from Monteith and Brumal, unto Atholia and Loquhabria, there are bred white oxen, maimed about the neck like a lion, but in other parts like ordinary and common oxen. This wood was once full of them, but now they are all slain, except in that part which is called *Cummirnald*. This beast is so hateful and fearful of mankind, that it will not feed of that grasse or those hearbs whereof, he savoureth a man hath touched, no, not for many days together, and, if by art or policy, they happen to be taken alive, they will die with very sudden grief. If they meet a man, presently they make force at him, fearing neither dogs, spears, nor other weapons. Their flesh is very pleasant, though full of sinews, and very acceptable to the greatest nobles, for which cause they are grown to a small number; their qualities being like to the former beast (the bison), excepting their colour and beard, I will term them a white *Caledonian or Scotian Bison*." *

Wild white cattle, the supposed descendants of those alluded to, still remain at Chillingham Castle, in Northumberland; at Wollaton in Nottingham; at Gisburne, in Craven; and at Chartly, in Staffordshire. In Scotland we are not aware of their being now preserved elsewhere than by the Duke of Hamilton, in the county of Lanark. None of these animals agree with those above described in the possession of manes. The Scotch breed are fully larger than those of England, but all of them are, in truth, rather poor creatures, compared with the *beau ideal* which we are apt to form of the strength and gran-

on the King; howbeit he had na wappinnis in his hand to debatt himself fra the dint thair of: Incontinent, ane man of great spirit, whilk wes standing neir by, lap afore the King, and nocht allanerlie kest the bull bi manifest force to the erd, bot held him, quhill the remanent huntaris slew him with thair wappinia. This man that rescouris the king was called Turnbull, and wes rewardit with rich lands bi the king. And thought thair bullis wer bred in sindry boundis of the Calidon wod, now, be continewal hunting and lust of insolent men, they ar destroyit in all parts of Scotland, and name of them left bot allanerlie in Cumirnald."—*The Cosmographie and Description of Albion*, prefixed to Bellden's Translation of Boethius's *History and Chronicles of Scotland*. Tait's Reprint, chap. x. p. 39.

* See Topsel's History, p. 41.

deus of a wild bull. They are much smaller than well-fed cattle of the ordinary breeds. Their colour is white; their muzzles, I believe, invariably black; the inside of the ear, and about one-third part of the outside, from the tip downwards, red; the horns are white, with black tips, of a fine texture, and (a curious coincidence) bent downwards, like those of the fossil species. The bulls weigh from thirty or thirty-five to forty or forty-five stone, and the cows from twenty-five to thirty-five stone (fourteen pounds to the stone). They vary slightly in their appearance. Those of Burton Constable, which were all destroyed by distemper in the middle of last century, had the ears and tips of the tail black. Those of Scotland are, for the most part, hornless, or are merely furnished with a blunt rounded corneous protuberance. "Their manners differ from those of domestic oxen, and may be in part those of the ancient urus. Upon perceiving a stranger they gallop wildly, in a circle, round him, and stop to gaze, tossing their heads, and showing signs of defiance; they then set off, and gallop a second time round, but in a contracted circle; repeating this circular mode of approaching till it becomes prudent to retire from their intended charge. The cows conceal their calves for eight or ten days, going to suckle them twice or three times in a day; if a person comes near the calf, it conceals itself by crouching. One, not more than two days old, being discovered by Dr Fuller, was very lean and weak*. On his stroking its head, it got up, pawed the ground, bellowed very loud, went back a few steps, and bolted at his legs: it then began to paw again, and made another bolt, but, missing its aim, fell, and was so weak as not to be able to rise; but by this time its bellowing had roused the herd, which came instantly to its relief, and made the Doctor retire. When one of this breed happens to be wounded, or is infected by age or sickness, the others set upon it, and gore it to death."†

Though the straightness in the backs of these animals, the fierceness of their dispositions, and their agreement in several particulars with the ancient unreclaimed breed of Britain, affords a reasonable ground of conjecture, that they are the primitive source

* The anecdote is elsewhere ascribed to Mr Bailly of Chillingham.

† Hamilton Smith.

of our domestic cattle, I am rather inclined to regard them as descended from the same source, than as clearly constituting that source itself. I do not think that we are entitled to consider them otherwise than as a permanent and remarkable variety of long standing, continued in purity by the accidental circumstances of their situation. Whatever may have been the original source of their peculiar colour, they have now, for a period considerably prior to the Reformation, been confined in parks as a marked and peculiar race, where they could hold no intercourse with other than their own kind; and, by breeding so long *in and in*, as it is called, they have, I conceive, eventually lost all tendency to sport, or exhibit any considerable variation in the colour of their coats. That they existed in this country at a very early period, is evident from what we have already said of the *Jubati Bisontes* of Boethius, the Chronicles of Holinshed, and the description of the *Bison albus Scoticus seu Caledonicus*, given by Aldrovandus. But I am much inclined to conceive, that the source from which our domestic cattle were derived, was not a white animal, but one of a dark brown or black colour. There is a natural tendency in all cultivated animals to assume, or revert to the colour of the natural species. Hence, our domestic breeds of oxen, in their wildest, or least cultivated state, and in that in which they are most exposed to the inclemencies of the weather, are generally either black or dark rufous brown. The kinds which are characteristic of the Highlands and Islands of Scotland, for example, which probably lead a life more allied to that of an unreclaimed animal, than such as pasture under the more genial sky, and over the more abundant herbage of the southern counties of England, exhibit a great preponderance of the darker colours, while the larger breeds, which have descended more immediately from foreign crosses, of comparatively recent introduction, and which consequently require and receive a more careful and assiduous cultivation, and a greater share of artificial appliances, never fail to manifest a proportionate increase of white, and other patches of more varied hue. This, I think, indicates that white in cattle is what I would call a colour of cultivation, while black or brown is more characteristic of their natural condition. Now, the colour of the urus is believed to have been

black, deep grey, or very dark brown; and some antique representations of the most ancient of the German and Polish races show that these were of a sooty black, with a spot of white upon the chin. According to some authorities, the bull of the wild urus was black, and the cow chesnut-brown *. These considerations afford an additional presumption in favour of that opinion which advocates the descent of our common cattle from the greater or lesser urus of ancient writers, rather than from the wild white cattle, commonly so called, of the British forests.

It is our intention, ere long, to present to the public a memoir on the history of these cattle, with figures, and descriptive and anatomical details. Through the condescension of his Grace the Duke of Hamilton, on the obliging application of Mr Rutherford, writer to the Signet, one of the Hamilton breed was last year killed, with a view to facilitate my inquiries; but circumstances occurred which prevented my taking advantage of so favourable an opportunity. The head of the animal is, however, preserved in the Museum of the College of Surgeons, under the superintendence of Dr Knox.

The only other animal which has been brought forward as the probable source of our domestic cattle, is the *Aurochs* of the modern Germans, or European Bison (*Bos Bison*), before described. It still inhabits the forests of Southern Russia, those of the Carpathian and Caucasian Mountains, and the deserts of Kobi. There are several considerations which render such a source unlikely, if not impossible. The form of the skull, one of the most invariable characters, is very different in these animals. The forehead of domestic oxen is flat, or even slightly concave; whereas that of the aurochs or bison is arched. In the ox, it is nearly square, or equal in height or breadth, taking the base between the orbits; but, in the aurochs, the breadth of that part surpasses the height in the proportion of three to two. But the strongest distinctive character consists in this,—that the aurochs has fourteen pair of ribs, while the ox has only thirteen. In the former animal also, the tongue is blue; in the ox flesh

* “ Les femelles n'étaient jamais noires mais chataines; le rut etait en Septembre; la mise bas en Mai, c'est neuf mois comme la vache; la buffle porta dix mois, l'aurochs onze.”—*Dermoulins in Dict. Class. d'Hist. Nat. t. ii. p. 370.*

colour. These, and other circumstances, which need not be here more minutely detailed, render it unadvisable to regard the European bison as the origin of our domestic cattle.

I shall conclude this communication with a few miscellaneous observations of a general nature.

The size of oxen, in general, seems to bear a more immediate relation to the quality of the pasture, than to the nature of the climate. The Danish cows, though lean, are larger than the French; and, when transported to Holland, they become very fat; and yield great quantities of milk. The cattle of the Ukraine, of which the herbage is abundant, are equal in size to any in Europe; and those of Switzerland, which find, even on the tops of mountains, a sweet and highly nutritious pasture, are larger than those of the neighbouring countries. In Barbary, and most of the African regions, where the land is dry and sandy, and the pasture meagre, the cattle are small, and are observed to lose their milk as soon as the calves are removed. So likewise, in many parts of Persia, in Lower Egypt, and Great Tartary, the size of the cattle is proportionate to the scanty supply of herbage; whilst, in Kalmuc Tartary, in Upper Ethiopia, and in Abyssinia, they attain to a much greater size. In northern countries, in temperate climes, and under equatorial regions, we find cattle of all sizes, and are thus led to infer, that it is the increased abundance of food, rather than any amelioration, or other change of climate, which produces an increase in their dimensions.

The size of the horns does not, in any way, indicate the dimensions of the animal; for some small breeds have large horns, and some good sized ones, such as the Yorkshire polled cattle, have no horns at all*. The fact is, that, in cattle, the horns continue to grow even after the animal has, in every other re-

* In a communication which I had lately the honour to receive from a distinguished French naturalist, he expatiates, at some length, on the fact that young cattle *butt* with their heads many months before their horns have made their appearance. I am not acquainted with the classification or nomenclature of ideas adopted by our modern metaphysicians; but my Parisian correspondent attributes this precocious butting propensity to the calves being born with what he is pleased to term "*des idées cornées*," or *horny ideas*!

spect, attained its full growth ; and, as there is a much greater tendency in the fluids of one individual, than in those of another, to produce that secretion which in its indurated state is called horn, these external organs consequently bear little or no relation to the size of the body. Were the size of the arnés, for example, or great Indian buffalo, to be estimated (on the principle of *ex pede Herculem*), from the extent of its horns, its dimensions would exceed those of the elephant. It is, however, known not to surpass the height of five or six feet, which is only equal to that of the large Hungarian oxen.

Although food and climate are very influential in regulating the size and external aspect of cattle, they do not appear to exert so powerful an influence as to change, or greatly modify, substantially specific characters. The buffalo of Italy is characterized by the same hard black coat of thinly scattered hair as it exhibits among the sultry islands of the Indian Archipelago. The domestic oxen of European origin, which have become wild or domesticated in the Llanos of the Caracas and the Pampas of Buenos Ayres, though perhaps more uniformly coloured, present no other distinction to those of Europe *. “Oxen,” says Buffon, “like other domestic animals, differ in colour, but red appears the most common colour, and the redder they are the more they are esteemed. Some prefer the black ; while others assert that, those of a bay colour last longest ; that the brown are sooner fatigued, and shorter lived ; that the grey, brindled, and white, are not proper for farm work, and are only fit to be fattened for slaughter.” It is believed in France, that black cows give the best milk, and white ones the greatest quantity.

The sense of smell is acute in all cattle. Their sense of sight is somewhat peculiar in its nature. It cannot be said to be very quick in regard to form, distance, or position ; and yet it is sometimes exquisitely affected by a peculiar colour, red for example, which frequently renders these animals perfectly furious. This effect is, however, in all probability, related to some inward af-

* I observe that Dr Roulin states that all the South American horses (unredeemed) are dark brown, the asses dark grey, and the hogs black. I have seen numerous troops of domesticated hogs in the Swedish forests, all of which were likewise black.

fection unconnected with an unusually vivid perception in the bodily organ, just as, in certain individuals of the human race, the influence of a musical ear gives rise to ideas and associations in no way dependent upon a quicker perception in the sense of hearing.

The power of man in subduing the larger animals, such as the horse, the camel, the buffalo, and the bull, was, I doubt not, originally brought to bear upon the brute creation rather by gentleness than force. A wild horse in the adult state, full of strength and vigour, and unconstrained by the spirit-breaking habits of an accustomed slavery, could scarcely be induced, either by force or guile, to submit itself as a beast of burden to the human race. Neither could the buffalo, an animal at all times of doubtful docility, “with a sombre, malignant eye, active, daring, swift, and persevering, when excited,” though dull, slow, and wallowing, in his ordinary condition, be easily subdued. We know, however, that the young of all animals, and more especially of herbivorous ones, have a strong affection for their parents; and that, when the hunter has slain the mother, and carried off her carcass, the bereaved offspring will follow the dead body, and thus submit themselves voluntarily to the power of man. The heroic traditions of the Greeks, and of other credulous lovers of a remote ancestry, may describe with truth or verisimilitude, the efforts of demi-gods and men in the destruction of wild beasts; yet, as far as actual subjugation is concerned, it would have required both Castor and Pollux to bridle a wild horse.

But the young of one or other of the above named animals having been brought up in the family, and accustomed to the society of man—cherished perhaps in the first place as the playmate of infancy, and afterwards retained in its more burly and uncouth condition from pity or affection, would in the progress of time, through choice or accident, become a beast of burden, and one of the first parents of an enslaved race, destined after the lapse of centuries, to produce innumerable tribes, available for the various purposes of pastoral and agricultural life, for the peaceful pursuits of the merchant, or the more energetic enterprises of the warrior or huntsman. Thus, at some unknown period of remote antiquity, from a pet calf or a trembling foal,

have probably been derived those now domesticated animals, which, in their totality, through the superintending foresight of providence, may be said to have altered the constitution of society, and the character of the human race.

“ The immense advantages derived from the domesticated ox in the beginning of human civilization, may be gathered from the conspicuous part its name and attributes perform in the early history of mankind. We find the bull among the signs of the Zodiac; it typifies the sun in more than one system of mythology, the supreme power as Jupiter among the Greeks and Romans, the strength of war with Mars; the sinews of commerce with Mercury, but still typifying the sun; the Dolichenus among the Sequanian Gauls. The bull was personally worshipped by the names of Apis and Mnevis among the Egyptians, and is still venerated in India. The cow is repeatedly a mystical type of the earth in the systems of Ancient Greece; or a form of Bhavani with the Hindoos, and still more marked in the lunar arkite worship of the Celtic nations. The Hindu Vedas consider it as the primordial animal, the first created by the three kinds of gods, who were directed by the supreme Lord to furnish the earth with animated beings. The ox first enabling man to till the ground, was a direct cause of private territorial property and of its consequences, wealth *, commerce, leisure, and learning; he was no less the means of abstracting mankind from the necessity of shedding blood, and thus he became the emblem of justice, the vehicle of Siva. This merited consideration we see dexterously used by ancient legislators to soften the brutality of human manners, either by forbidding the flesh as food in those countries, where his acknowledged utility was counteracted by obstacles in the increase, or by commanding the frequent use of sacrifices by a proper slaughter, and where *fire and salt* should be employed to check a horrid species of massacre, and the practice of devouring the flesh in a raw state. Such are the meaning of the prohibitions

“ * Hence the ox stamped upon the coins of Attica; hence the cow is a representation of money in ancient Irish translations.” The Latin name of money, *pecunia*, is also supposed to be derived from the term *pecus*, applied to sheep or cattle.

in Deuteronomy; and the necessity of these prohibitions is but too manifest in the ancient allusions of Orpheus, which inculcate that principle, when we find Julius Firmieus, many ages after, reproaching the civilized Greeks with perpetrating these horrid repasts in their Dionisiacs. ‘Vivum laniant dentibus taurum;’ and again, ‘Alter, cruentus ore, dum viva pecoris membra discerpit;’ which evidently mean the brutal repast still practised in Abyssinia, for which the veracity of Bruce was so vehemently impugned by ignorant philanthropists and wits.”

“The words Thur, Tur, Teir, Deer, Stur, Steer, in the northern dialects of Europe, in their early and in their latest acceptations, are direct names of well known ruminants; but in proportion as we pursue the root towards its origin in Central Asia, we find that the parent language of the Gothic and Sclavonian, as well as of the Hellenic and others, unite in fixing it upon a large bovine animal, perfectly applicable to that known in *Cæsar’s Commentaries* by the name of Urus, implying primeval, ancient, silvan, fierce, mysterious; still retained in the Teutonic *ur*, and its numerous adjuncts. We there find the root of the denomination of several regions in which the parent race of the Tauri or the Urus, has existed, or still resides. Thus Turan of Eastern Persia, Turan south of the Caucasus, the cradle of the Turkish nation; the present Turcomania; the Thurgau; the Canton of Uri; the Thuringian forest; and, if we take the root from the southern and eastern *Ταυρος*, Taurus, we find the Tauric Chersonesus; the Touri, a Sarmatian tribe, the Taurini inhabiting Italy, near the present Turin, &c. In most of these countries, the gignatic Urus has left his remains, or the more recent Urus has been known to herd. In the same manner, the word Ox, Ocha, *Οξυς*, derived from the same original language, applied it seems both to the domestic animal, and to rushing waters*: thus the river Oxus, or Gihon or Ghayon,

* Rivers were sometimes of old named Taurocrani or Bull-heads, for the four following reasons: *First*, because when they empty themselves into the sea, they roar or bellow like bulls, with the noise of their contending waters; *secondly*, because they furrow the earth like a draught of oxen with a plough; *thirdly*, because the sweetest and deepest pastures to which cattle resort are near to rivers; *fourthly*, because, by their crooked and sinuous courses they imitate the fashion of horns, and are also impetuous, violent, and irresistible.

the Cow river, perhaps figuratively on account of its source rising from an ice-cavern like the Ganges, representing a cow's mouth. The word implies a title of power, and is a proper name. Ochus occurs in Persian history, Okous or bull, is a common name among the Curds (Coords) and other Caucasian (Gau-cas) tribes, *Bovs*, Bos, and the Arabic Bakr, Koe, Kuhe, Cow, Gau and Ghai, are evidently from a common root, descriptive of the voice of cattle *."

* Griffith's *Animal Kingdom*, vol. iv. p. 411. In addition to the above, I subjoin a note from an author already quoted. "The Hebrews call him Tor, or Taur, which the Chaldees call Abir, for a strong ox; so the Arabians, Taur; the Grecians, Tauros; the Latins, Taurus; the Italians, Tauro; the French, Taureau; the Germans, ein Steer, ein Vuucherstier, das Vucher, ein Mummelstier, ein Hagen, and ein Bollen; the Illyrians, Vul and Tunez; by all which several appellations, it is evident that the name of Taurus in Latin is not derived from Tanouros, the stretching out the tayl; nor from Gauros, signifying proud; but from the Hebrew, Tor, which signifieth great; upon which occasion the Grecians called all large, great and violent things by the name of Tauroi, and that word Taurus among the Latins hath given denomination to men, stars, mountains, rivers, trees, ships, and many other things, which caused Joachimus Camerarius to make thereof this enigmatical riddle:

Mæchus eram regis; sed lignea membra sequebar.

Et Cilicum mons sum, sed mons sub nomine solo.

Et vehor in cælo, sed in ipsis ambulo terris.

That is, in divers senses, Taurus was a king's pander, the root of a tree, a mountain in Cilicia, a bull, a mountain in name, a star or sign in heaven, and a river upon earth."—Topsel's *History of Four-footed Beasts*, p. 48.

SOME REMARKS ON THE VALUE OF LIVE-STOCK, WITH RELATION TO THE WEIGHT OF OFFAL. *By ADAM FERGUSSON, Esq. of Woodhill.*

IN the improvement of live-stock in this country, the views of breeders have been long directed to the selection of animals of good shape, and a "kindly handling;" and attention to the establishing of new breeds, or to the improving of old ones, has always been appreciated by the public, as reflecting credit upon the enterprise of the individuals, and as conducing to the prosperity of the country. A judicious improvement in live-stock

is not limited in its effects to that object alone. It never fails, at the same time, to improve the agriculture of the country around; the land being necessarily drained, enclosed and cultivated, in a manner adequate to raise the superior kind and quality of the produce now required. Such being the beneficial consequences of an improvement of live-stock, no suggestion ought to be disregarded which may lead to that important end. It may be laid down as a maxim, that those breeds or varieties are the best which will pay most, all things considered, in the shortest period, or which will produce the greatest weight of marketable produce from any given extent of land, and within any given period. And, in like manner, it may be stated, that the animal of any given breed, which, in relation to its live-weight, will bring to the butcher's stall the greatest quantity of good meat and tallow, is the animal of greatest value. Now, there is some reason to suspect, that a question having relation to this latter point has been of late too much overlooked, arising from carelessness on the part of the farmer, with some professional mystery perhaps on the part of the butcher. The question here referred to is that of the live and dead weight; and the ratio which the one bears to the other in properly fed animals. It is true, that various Tables, founded on the determination of this question, have been constructed with the view of assisting the farmer in the disposal of his stock, and such Tables are no doubt to a certain extent convenient and useful. A difficulty, however, has generally presented itself in bringing their accuracy to such a direct and palpable test, as to be sufficient to silence a keen and depreciating purchaser, and compel him to admit, that the seller does not over-rate the weight of the animal. It would seem that attention, at once more extended and minute, must yet be bestowed before the relative live and dead weight of stock can be ascertained, in a manner equally satisfactory to the buyer and the seller.

The particular error into which, it is conceived, many have fallen, lies in estimating the dead at only one-half of the live-weight. It is sufficiently apparent, that should the former, in any material degree, exceed this proportion, a very serious loss may be incurred by the seller, who founds his calculation upon that *datum*; and from some authentic returns to be just sub-

mitted to the reader, it will be seen that an inference to this effect may be reasonably drawn.

In the extensive farming concerns of the late Mr Curwen at The Schoone, a mode of estimating dead-weight was adopted, somewhat singular in its nature, and said to be remarkably correct in its results. Glover, the stock-bailiff, a very intelligent man, made use of what he called his "magical number" 556, by which, upon receiving the live-weight, he professed to give the dead-weight, sinking offal, of any fat animal submitted to his test*. In one instance, verified by the writer, Glover's calculation certainly approached very nearly to the truth, and gave a greater return than competent judges were disposed to allow from handling the animal alive.

The subject of experiment was an Ayrshire heifer, 18 months old, which Mr Curwen slaughtered at one of his general meetings, as a sample of his favourite system of soiling. This animal had never been a day out of a calf-pen or straw-yard from her birth, had never tasted oil-cake or corn, and was undoubtedly a very forward animal at so early an age. Her live-weight was correctly ascertained to be 55 stones, of 14 lb. to the stone, which being applied as a multiplier to the famous number, and cutting off the three figures on the right, gave the following product: $556 \times 55 = 30580$, that is, holding the three right-hand figures as decimals, about $30\frac{1}{2}$ stones. The weight of this heifer by measurement in Ainslie's Tables, was pretty nearly the same. The actual result gave 30 stones of meat, and 2 stones of loose fat, fine marbled beef, but by no means prime

* The writer need scarcely observe, that there is nothing really *magical* in the number 556, nor in the manner of obtaining it. If an ox were to weigh 50 stones when alive, and the dead-weight were found to be 25 stones, the ratio of dead to live weight would be represented by the fraction $\frac{1}{2}$, which, converted to decimals, would give .5, and this, multiplied by the live-weight, would give the dead-weight. But if Mr Glover, by a series of more correct observations, found that, upon an average of oxen, the live-weight was 50 stones, and the dead-weight 27 stones 11 $\frac{1}{2}$ lb., the proportion of dead to

live weight would be represented by $\frac{\text{st. } 27 \text{ } 11\frac{1}{2} \text{ lb.}}{50}$; which, converted to decimals, would give .556; which again multiplied by the live-weight, would give the dead-weight.

fat. In this animal, then, which had certainly not attained a state of perfection, we have a return considerably exceeding one-half of the live-weight

Mr Rennie of Phantassie, and Mr Curwen, with their respective adherents, differed in their estimation of the live and dead weight upon general principles. Mr Rennie would not allow more than one-half of the live-weight to be reckoned upon, except in cases of extraordinary fat, to which, certainly, the heifer in question had no pretensions, and in whose case, notwithstanding, the proportion of Mr Rennie was considerably below the mark.

The following details will still farther illustrate this subject, and may tend to excite more than a doubt, whether one-half be not too small a proportion to be assumed in estimating the live and dead weight of stock.

TABLES of Sheep and Cattle slaughtered in various Years, with the Amount of Live and Dead Weight per Stone of 14 lb.

I. SHEEP.

	Live Weight.		Dead Weight.		Tallow.	
	St.	lb.	St.	lb.	St.	lb.
1. A Leicester Sheep, 2 years old,	12	0·4	9	7·4	1	5·7
2. A Cheviot Sheep, 3 years old, -	10	7·6	7	7	1	10·1
3. A Black-faced Sheep, 5 years old,	11	2·4	8	1·6	1	12·1
4. A Black-faced Wedder, 4 years old,	12	0	6	4		
5. A Cheviot Wedder, 3 years old,	8	6	4	12		
6. A Leicester Wedder, 2 years old,	11	8	7	3		
7. A Black-faced Wedder, 5 years old,	10	0	5	10	1	4
8. A Cheviot Sheep, 18 months old,	7	8	4	0	0	10
9. A Cheviot Ewe, 4 years old, -	7	12	3	12	0	13
10. Do. do. - - -	7	7	3	9	0	11
11. Do. do. - - -	7	11	3	11	0	12
Total	106	6·4	64	7·2	9	7·9
Average,	9	9·5	5	12·1	1	2·7

According to the average in the above Table, Mr Glover's rule would give 5 stones 5 lb. as the dead-weight; but the true multiplier would be ·605, instead of ·556, according to Mr Glover's practice, or instead of ·500 according to the common practice.

II. CATTLE.

	Live Weight.		Dead Weight.		Tallow.		Hide.		Other Offals.	
	St.	lb.	St.	lb.	St.	lb.	St.	lb.	St.	lb.
1. Aberdeenshire Ox,	132	11.4	84	6.3	16	5.7	7	2.6	24	10.8
2. A short-horned Ox,	132	0.4	90	1.1	14	0.9	5	8.7	22	3.7
3. A short-horned Quey,	120	4.4	77	9.2	15	8.8	5	0	22	0.4
4. A Stot, - - -	120	5	67	7	14	12	7	7	30	7
5. A West-Highland Stot,	83	8	46	3	6	3	5	4		
6. An Aberdeenshire Stot,	96	0	53	4	8	4	5	9		
7. Do. - - -	86	4	47	2	8	0	6	0		
Total, -	771	5.2	466	4.6	83	6.4	42	3.3	99	7.9
Average, -	110	2.7	66	8.7	11	12.9	6	0.4	24	12.4

The above Table gives the same result to a fraction as the last, and this curious coincidence is deserving of notice, as occurring in the case of animals so entirely distinct in their form and character as sheep and oxen are.

The general conclusion to be drawn from these returns would seem to be, that the practice of estimating the dead-weight at one-half of the live-weight is erroneous. It would by no means, however, be safe to draw a specific conclusion as to the actual proportion of live to dead weight from the Tables now given, on account of the limited number of the returns made. It is only by means of a great number of such experiments that we can hope to obtain a just medium, and found upon it a safe conclusion. Could farmers be induced to give more attention to this subject, by keeping accurate records of stock slaughtered by themselves or their friends, much might be speedily done to settle the question of the live and dead weight, while there is good reason to believe, that many respectable butchers would concur in preserving and communicating similar details. A further purpose might be promoted by constructing such Tables. We should, by means of them, be able to discover the breeds or varieties of our different species of stock which yield the greatest returns in proportion to the offal, and thus perhaps be enabled to draw conclusions as to the relative value of different breeds.

It has been before observed, that the question of the ratio of live to dead weight seems to have been a good deal overlooked

of recent years. At one period, the attention of individuals, admirably fitted for the investigation, appears to have been awakened to the importance of the inquiry. In the able report of the county of Durham, some interesting details on the subject are given; but these can scarcely be said to do more than to open up the subject; and certainly a great blank remains to be filled up, before the farmer and the professional butcher shall be placed on equal terms, as regards their information upon this point.

Should these cursory remarks tend to recall the attention of breeders and graziers to this interesting subject of inquiry, the object of the writer will have been fully accomplished.

ON THE APPLICABILITY OF CERTAIN PARTS OF THE SCOTTISH SYSTEM OF HUSBANDRY TO ENGLAND. *By the Right Honourable Sir JOHN SINCLAIR, Baronet. In a Letter to the Editor.*

SIR,

IT is of great importance to ascertain to what extent the Scottish system of farming is applicable to the culture of land, and the management of farms in England, more especially as, in several instances, Scottish farmers have not succeeded in that country, I was thence induced to put several questions to Mr Dickson, who had occupied a farm near Edinburgh, which he had managed with great ability and success, and who has for some time past cultivated a farm, called Kidbrooke, near Blackheath; in Kent. During my residence in London last June, Mr Dickson happened to call on me, and seemed very well disposed to give me any information on the subject in his power to furnish. I was thence induced to draw up some queries, to which he sent me very distinct answers, which contain information well entitled to the consideration of those who either propose taking farms in England, or are already settled there, and the substance of which I think it right to send you.

Mr Dickson is of opinion that the Scottish system, as regards

the management of light lands, is applicable to the same class of soils in England, with the exception of the practice of sowing turnips in ridged-up drills. At the season of the year when that is generally done, the soil, he conceives, dries so fast as to prevent vegetation; and the best method, accordingly, in the case of turnips, is to sow them drilled on the flat surface.

In speaking of light soils, it is presumed that Mr Dickson has had chiefly in view those thin chalky soils which cover such extensive districts, but to which nothing similar is known in other parts of the kingdom. In the county of Norfolk the turnip drill-culture has been adopted with much success; and there is a vast part of the kingdom so similar in character to the northern border counties of England, where this species of cultivation is practised on a scale of the greatest magnitude, that it would be difficult to admit the force of Mr Dickson's objection, but under great limitations and exceptions.

With regard to the Scottish system of fallowing, Mr Dickson is of opinion, that it is not suited to the more tenacious clays of the southern counties of England. The fallow-land on such soils, he contends, should not be broken up before it is dry in May. If ploughed in autumn, and if the winter prove open, with little frost and much rain, it gets too firm, and retains the moisture, becomes soured, and requires much trouble to get it dried for cleaning in spring, and frequently, before this can be done, it is reduced too fine on the surface for wheat. All such clay soils require the horses to go in the furrows if the land is moist. Treading does much harm on such land before ploughing, and if the horses' feet make any impression, this will remain and hold water when taking up the last two furrows of a ridge. In ploughing stubbles; if wet or damp, the treading of the horses' feet on the land will, in a great measure, prevent the proper turning over of the furrow-slice.

In answer to a query on the difference in the expense of labour, in carrying on the cultivation of land in England, compared to the expense in Scotland, Mr Dickson observes, that the expense is fully 80 per cent greater in the former country. The poor's rates, besides, are generally 80 per cent. on the rental, and in some parishes 50 per cent. From the distressed state of the country, and the reduced capital of the farmers, the

latter are not able to employ a sufficient number of hands, to reduce the poor's rates, and the lands are getting into a state of deterioration. "There is great reason to apprehend," he observes, "that unless some important changes soon take place, the owners and occupiers of land will be reduced to a deplorable state. I find, in most counties around London, that the capital of the farmers is very greatly reduced within the last four years, for, in numerous instances, many have paid their rents from capital, and others from borrowed money. When farms have come to be re-let, a respectable tenant cannot be procured unless at a reduction of fully from 25 to 30 per cent. This is very generally the case, and at this next Michaelmas, I know of many proprietors who will have large tracts of land given up to them."

With my best wishes for the success of your interesting and useful publication, I remain, &c.

EDINBURGH, 133. GEORGE STREET,
19th December 1829.

ON THE ANATOMY AND DISEASES OF THE FOOT OF THE HORSE,
—THE TREATMENT AND PREVENTION OF CONTRACTION.
By Mr WILLIAM DICK, Veterinary Surgeon, Edinburgh.
In a Letter to the Editor.

SIR,

IN the latter part of my last letter (vol. i. page 731.), I endeavoured to explain the nature and causes of Contraction, Navicular Lameness, or Grogginess; and, at the conclusion of it, I gave an enumeration of the symptoms of the disease. In the present letter, after offering a few further remarks on the symptoms, I shall proceed to point out the means to be adopted in the treatment and prevention of the disease.

The foot of the horse, as has already been stated, is attacked by this disease in various ways. In some, the attack is sudden; in others, its progress is slow. In the former case, it commonly arises from an injury done at the seat of the disease. In the

latter case, the injury extends from the other parts of the foot ; and here we have the symptoms formerly enumerated,—the shifting of the feet, the shortness of the step, and the heat of the heels and coronet. There is also a chronic degree of inflammation of the feet produced, which causes the animal to shift alternately his weight from the one foot to the other, in order to obtain relief ; and, when in action, he steps short for the same reason. No sooner does he raise the one foot from the ground, than the pain in the other, in supporting his weight, causes him to bring it quickly down, while the tenderness of the foot which has been elevated prevents him from raising it, for fear of the concussion arising from such action. Thus he moves with short steps, his feet scarcely raised from the ground, and is, in consequence, frequently tripping and stumbling. The tenderness, however, in his fore-feet produces also a carefulness of action : he throws his weight habitually upon his haunches ; and such horses are not, therefore, so liable to fall as might, upon observing their motion, be supposed.

As the disease goes on, the muscles of the shoulder become wasted, from the pain and irritation in the feet, and from the confinement of the action produced as above described. This change in the muscles of the shoulder has long proved a powerful source of deception to the farrier and proprietors of horses. The evident alteration in the muscles of the shoulder, and the apparent total absence of any morbid change in any other part of the limb or foot, afford to them a demonstrative evidence of the seat of the disease ; hence the term “shook in the shoulders.” But the physiological veterinarian takes another view of the case ; he knows that, if a person has a disease in the finger, and he is thereby prevented for a time from using the muscles of the arm, absorption of the muscles takes place, and they become shrunk more or less according to the duration and severity of the disease. Such is the view which he will take of the case in question ; and, instead of proceeding to rowel in the chest, blow the shoulder, insert a seton, blister, peg, or bore it with a red-hot iron (as is but too frequently the case for this *effect* of the disease), he will direct his attention to the foot, where the cause of all this mischief resides. The wasting of the muscles of the shoulder, and the apparent freeness of the foot and limb from

disease, is to him the strongest proof of the nature and seat of the injury. From these alone he is frequently obliged to form his opinion; and in cases of lameness in the fore-feet, which have existed for a few weeks, he will, in ninety-nine cases in a hundred, be correct in his opinion, with no other proof than the symptoms described. In those cases where only one foot is affected, the hoof, in addition to the other symptoms, generally becomes contracted, and smaller than the other, and thus serves as a guide to the seat of this hidden and deep-seated disease.

From what has been stated regarding the nature and seat of this disease, some idea may have been already formed of the difficulties that must occur in our attempts to remove it. If once the navicular bone has become ulcerated, and adhesion has taken place between it and the tendon, or if even osific particles have been deposited on the articular cartilage, all our efforts to effect a radical cure are futile and useless; all we can expect to accomplish, in such cases, is a mitigation of the animal's sufferings. Our attention ought, therefore, to be directed to the earliest stages of the complaint, while as yet there is only inflammation in the synovial membrane, if we wish or expect to effect a cure of navicular lameness.

Our treatment must be regulated by the causes which have operated to produce the disease in each of the individual cases which occur. In all cases, however, it must appear evident, that, in a part so much exposed to action as the navicular capsule is, *rest* must be of the first importance in the early stages of the complaint. Topical bleeding must also be allowed to be of equal importance; and this may be effected either by bleeding in the toe, or opening the pastern veins, or both may be opened with advantage; and although leeches have not been much tried in veterinary practice, a dozen might prove a useful auxiliary, if applied in the hollow of the pastern; and these means should be repeatedly had recourse to in severe and obstinate *recent* cases. Even general bleeding and purging may be of service, as means of diminishing inflammatory action. The foot should be kept in a warm emollient poultice for some time, or cold lotions may be constantly applied to the pastern and foot; even an ice-poultice, several times repeated, might be used with advantage. Should these fail, blisters are next to be tried; and

they should be applied all round the coronet and pastern; and several times repeated; for it frequently happens that, although the lameness may be removed by a single blister, the symptom returns when the animal is put to exercise, showing plainly that the disease had not yet been completely subdued. The blister ought, therefore, to be repeated, as a means of preventing the recurrence of the lameness, and to insure a more effectual cure. Nor ought the failure of success in the application of one or two blisters altogether to discourage the repetition of them; for I have not unfrequently seen a successful termination of cases even after having had occasion to repeat the blisters five or six times. The blisters must be freely applied in the hollow of the pastern, for, being nearer the immediate seat of the disease, they produce a greater effect upon it than if more remote. Nor need we be afraid of any unpleasant effects or blemishes taking place in this part more than any other, if a proper blister is used.

If, after a fair trial of blisters, a cure has not been effected, firing round the coronet and in the pastern may be tried; but if blisters fail in giving relief, firing is seldom attended with success. Where they have failed, a seton is frequently passed through the frog. The seton is made to pass from the pastern down through the centre of the frog, so as to exert a deep-seated counter irritation, and a discharge of matter from parts closely connected with the seat of the disease; and this discharge may be kept up by continuing the seton in the frog for a fortnight or three weeks. In this treatment, however, I have not much confidence.

Throughout the use of the various plans of treatment which I have mentioned, the greatest attention ought to be paid to the reduction of the inflammation in the other parts of the foot, as this greatly assists in effecting a cure. The sole of the hoof should be well pared, to allow of ease and liberty to the soft parts within. The shoe ought either to be removed or applied so as to give no restraint to the action of the hoof during the progress of cure, either by being put loosely on with few nails, or by a jointed shoe applied to the foot. The toe of the hoof ought to be made as low and short as it will admit of, and the heels left uncut, by which means the limb is brought more to the perpendicular line, and the force upon the seat of the disease in an equal proportion removed; and the hoof may be softened by making

the animal stand for several hours a-day in a trough with hot-water.

Such is a summary of what may be tried in the earlier stages of this disease; and although an endless variety of plans of treatment have been from time to time brought forward, and are still frequently adopted, with a view of enlarging the hoof and removing contraction, it will, I think, appear evident, if I have given a correct view of the nature of the affection, that all or most of them have been applied to remove merely an effect of the disease. For this reason, I have not brought forward or recommended the various plans of scoring the hoof, rasping the quarters, paring the heels, and giving the frog pressure, nor the different expanding shoes to enlarge the hoof; because, having shown that the contraction of the hoof is commonly an effect of the navicular disease, and that, in all cases of continued lameness from contraction, the navicular synovial capsule is the seat of the disease, the enlargement of the hoof cannot by any possibility remove it when once established in this part. If, therefore, the means which I have already recommended are not sufficient to remove the lameness, the animal must be pronounced a confirmed "grogg."

Should he be reduced to such a state, and be unable to perform a reasonable degree of work, or be otherwise unpleasant from the lameness he exhibits, the only alternative is to have him *unnerved*—an operation by which the foot is deprived of its nervous energy and feeling, by which the animal, unconscious of the existence of disease or pain in his feet, goes on doing his work, in many instances, for a considerable number of years, with apparent ease and freedom. But although this operation gives immediate relief from pain and lameness, unpleasant effects frequently soon follow. The operation of unnerving consists in making an incision through the integuments (skin), at or below the fetlock, on each side of the leg, and having exposed the nerves going to the foot, they are first divided, and a portion, about an inch or upwards in length, is dissected out. But as the operation requires some anatomical knowledge, and can only be properly performed by a person acquainted with anatomy, I need not enlarge further upon the method of operating.

The foot, I have already said, is exposed to many unpleasant effects from this operation. In consequence of depriving the foot of sensation, the animal is unable to distinguish whether he treads upon an even or an uneven surface, whether he has picked up a stone, been wounded in shoeing, or his foot bruised by the tightness of the shoe; the consequence of which is, that suppuration frequently follows these injuries, and, as the animal is still unconscious of what is going on in his foot, he continues to use it until the suppurative process has spread over the whole foot, and the hoof is detached. And, in cases of old standing, where the navicular bone has become ulcerated, the ulcerated surface, now that the parts are deprived of sensation, being brought freely in contact with the tendon, either excites inflammation and suppuration (as the division of the nerves does not here appear to influence or change the action of the vascular system of the foot), which, spreading to the surrounding parts, causes the hoof to be sloughed off; or the rough surface of the bone, now acting freely on the flexor tendon, in a short time, sooner or latter, according to the degree of previous disease or roughness of the bone, wears or cuts the tendon through by friction, and allows the pastern to come to the ground. This renders the animal completely useless, and there are no means by which we can completely guard against these effects, as we seldom know exactly the length of time the foot has been affected, nor the rapidity of the progress, or severity of the disease; and, as it is only by these that we can possibly judge, such judgment must, in many cases, prove fallacious.

I have operated on some horses that have stood sound for years; in others a few weeks determined their fate. I may mention an example of the latter: A poor carter some time ago brought his horse to me, very lame from the disease of which we have been treating; he was, in fact, useless; and I saw that the only thing which could be tried was unnerving. This I considered a forlorn hope, from the extreme lameness, but it was tried. The horse, as usual after the operation, got up sound, and the poor carter, although strictly enjoined to allow him a month or six weeks' rest, was so proud of the change, that, in a fortnight, he rode him to church, a distance of between two and three miles; and, in his vanity in thus showing him off to his acquaintances,

brought on the inflammation which I have already spoken of; the hoof sloughed off in two or three days, and all his hopes were at once blasted.

Such is the unfavourable view which we are compelled to take of this disease; and it therefore becomes of the first importance to prevent its occurrence. The many plans of shoeing that have from time to time been introduced, sufficiently show its obstinate nature, and have led to the remark, that it is a consequence of all shoeing, whether good or bad. With the opinion that shoeing is the cause of it, I certainly do agree, though on a somewhat different principle; for it must be observed, that the simple circumstance of the shoe preventing the hoof from being worn, at the same time enables the animal to undergo greater fatigue, and thus exposes the limbs and feet to the injuries already described. The common application of a shoe to the foot of a horse is so familiar to us, that we almost forget that it is an artificial appendage, and that it is by means of it that we are enabled to take so much advantage of his great power and speed. Without it, he would become lame, by his hoofs being broke before he could be made to undergo the exertion productive of grogginess.

If, then, I have been correct in the theory I have advanced, it must appear that grogginess is, in one point of view, a consequence of all shoeing, good or bad. But it must not be supposed, from what I have advanced, that all kinds of shoes will, in an equal degree, tend to produce the disease; on the contrary, I am of opinion, that much may be done in shoeing to prevent it, some of which means I have noticed in my last letter. But I must again remark, that the more the liberty of the foot is cramped and confined, the more liable will it be to disease; and it must therefore appear, that if a shoe, capable of allowing of the elastic action of the hoof, and calculated for ordinary purposes, could be formed, it would be preferable to all others. Such a shoe has been described in your last number by Mr Whyte; but I am afraid, that, however well Mr Whyte's shoe may appear to answer, when properly executed, the nicety required in forming the spring, and tempering, and the consequent expense, are insurmountable obstacles to the "every-day use" of such a shoe. There is such an endless variety in the

degrees of strength, size, and form of the hoof, that even the best workman, after devoting more than double the portion of time to its formation that is required for a common shoe, would, in almost every case, fail to give it the proper degree of spring on its first application. Although, therefore, it may answer well enough, if proper attention be paid to remove the *contraction* of the hoof, and also the lameness, where it arises from that cause alone, yet it cannot become a shoe for "every-day use," much less can it remove the disease, which, I have shown, is of a more serious nature than the contraction of the hoof.

But it appears to me, that, if we merely wish to produce the expansion of the hoof, this might be effected by a much simpler process, namely, by the application of Mr Coleman's clip-shoe; this shoe, having clips turned up, so as to press against the bars where they form the junction with the crust at the heels, and that in a proper sloping direction. These clips may be made to act like a wedge in expanding the foot, and that simply by a *spring* from the heel, or by having a small portion of the heels of the hoof lowered, so that, when the shoe is nailed on the hoof, it may have a space left between it and the shoe: And in this case, as the hoof is capable of descending, or rather has the property of descending, at every step, and as the clips at the junction of the bars are resting on an inclined plane, the heels, as they descend, must be thus expanded or pressed outwards. And the nails are placed on one side, well forward towards the toe, all the effects of Mr Whyte's shoe will be produced, with much less trouble and nicety.

Mr Turner of London has lately proposed that we should apply shoes, in every case, in the same manner as we are in the habit of doing in those cases where a horse is much inclined to cut; that is, applying the common shoe, with the nails extending only round the toe, or doing little more than making the turn of the toe. By this means, no doubt, the foot is left at almost its natural liberty, from the inside being unrestrained by the nails; but this plan, although it has been long adopted for horses which cut themselves, is not had recourse to in the ordinary course of shoeing, nor is it found so secure as when the shoe is nailed further back in the quarter of the hoof, and can only be used in good roads, or in the streets. In the field it is out of the question.

Goodwin's shoe I have noticed on a former occasion, as possessing advantages. By keeping the toe short, the concussion is prevented, the power of resistance against the action of the tendons and muscles of the extremity is so far removed, and thus much injury avoided. The best, however, of the new plans of shoeing, is Bracy Clark's jointed shoe, if to it is added a clip at each heel, in the manner I have already mentioned, as in Mr Coleman's shoe, by means of which the great objection to the jointed shoe is removed, namely, the straining of the nails by the motion of the shoe causing the crust to break away, and in this way doing more injury to the foot than all the advantages otherwise gained. But the joint and clips are obstacles to its common use, which it will, as in the case of Mr Whyte's shoe, require a great while to overcome; for the progress of the disease is not very obvious, and these plans, as preventives, are not likely, for a long time at least, to be introduced; while the common-seated shoe will still continue to overcome all those obstacles which have been opposed to it. But even if the objection to all these plans were obviated, still we have the difficulty which I have endeavoured to explain, namely, the circumstance of the shoe, by defending the foot from the wear and tear to which it would otherwise be exposed, enabling the animal to make those exertions we require of him, and thus in many instances producing grogginess, independent of shoeing in every other respect.

I would, in conclusion, remark, that one of the evils of shoeing is, that the whole weight of the animal is suspended by the laminae, both in a state of exercise and rest. In the first case, this cannot well be overcome; but, in the second, it may be effected, by filling the sole with some substance of an elastic nature, containing moisture; and nothing is better for this purpose than felt, which was first recommended by Mr Cherry of Clapham. The pads thus made not only effect what I have just mentioned, but also, when soaked in water, serve to keep the foot moist, and answer all the purposes of stopping, the use of which, with a loose box, regular exercise, and the other means I have mentioned, will, I think, effect all that can well be done, either to prevent the recurrence of this disease, or effect its removal, when it has once taken place. I am, &c.

ON THE WHEAT-FLY. *By Mr ARCHIBALD GORRIE, Annat Garden. In a Letter to the Editor.*

SIR,

PERMIT me, through the medium of your valuable Journal, to lay before your readers some account of that fly which has done so much damage to the wheat crops in Scotland, in this and the two past seasons.

With a view to remove some existing prejudices upon the subject, and to ensure the co-operation of practical farmers in destroying this most destructive gnat, I shall give a short history of its habits, as far as I have traced them, and then propose a simple method by which I conceive it may be destroyed.

A question at the outset will very naturally occur, From whence have the flies come, and how have their generations been perpetuated? To this I answer, that I believe they are natives of our island; for I have observed them deposit their eggs, and their maggots come to full perfection, in the ear of one of our native grasses, the *Triticum repens* of Linnæus; which grass is a species of wheat, and this shows the partiality they have, in common with other insects, for propagating their species on kindred plants. On a most careful examination, I could discover them on no other of the gramineæ. If, then, they are propagated on one of our native grasses, they may have existed in this country even before the introduction of wheat into it, and have been since perpetuated, from year to year, in greater or less numbers, according to the existing temperature which may have brought them into the fly state, at, or some time after, the wheat was in the ear. The grass above alluded to, better known amongst farmers by the name of "Couch-grass," which comes into ear at different periods of the season, was always sufficient at least to save the breed.

In the Transactions of the Linnean Society, the Rev. W. Kirby gives an account of an orange-coloured gnat, which he calls the *Tipula Tritici*, which is quoted in Loudon's Magazine of Natural History, with drawings of the insect, the grain, and the larvæ. The drawing representing the female, however, is

much more like another fly which I have seen than the wheat-fly, which has no permanent sting, nor have I ever seen it straight. About the years 1796 and 1797, much about the same period at which Mr Kirby observed the fly, the maggots were observed by some farmers in the Carse of Gowrie; they were also observed in the years 1808 and 1809; but it was not till 1827 that they were recognised in numbers so formidable as to threaten destruction to the wheat crops. It may be here remarked, that the loss sustained by the farming interest in the Carse and Braes of Gowrie in this and the two preceding crops, by the ravages of this little fly, has been estimated, by competent judges, to exceed Ninety Thousand Pounds—a sufficient loss, one would suppose, to excite attention to the subject.

As soon as the mean temperature of a week or ten days rises to 57° or 58° of Fahrenheit's thermometer, which is generally about the first or second week in June, the flies begin to appear in those fields where wheat was the preceding crop, whether these fields be under potatoes, clover, or beans. If this elevated temperature occur in the end of May, or nearly a month before the wheat comes into ear, as was the case in 1826, the greater part of the flies are exhausted before the ear begins to appear, and the remainder make no sensible impression on the crop. If, however, this temperature does not occur till the exact period at which the ear bursts its sheath, as was the case in 1827,—8,—9, the whole are vigorous, and not an ear escapes. In illustration of this, I shall give the following extract from the Meteorological Register kept here:—

YEARS.	MEAN TEMPERATURE.	Wheat came into Ear
1826,	<div> <div>From the 12th to the end of May, . . . 57 °</div> <div>First week in June, . . . 57</div> <div>Second week in June, . . . 64</div> </div>	June 17.
1827,	<div> <div>From the 12th to the end of May, . . . 54</div> <div>First week in June, . . . 53</div> <div>Second week in June, . . . 62</div> </div>	June 20.
1828,	<div> <div>From the 12th to the end of May, . . . 52½</div> <div>First week in June, . . . 53</div> <div>Second week in June, . . . 59</div> </div>	June 22.
1829,	<div> <div>From the 12th to the end of May, . . . 53</div> <div>First week in June, . . . 55½</div> <div>Second week in June, . . . 57</div> </div>	June 23.

When the wheat comes into ear, the flies are led to it, probably by the smell, and the side adjacent to the last year's wheat-field is first attacked, and is often most destroyed. I have traced them to the distance of three-fourths of a mile, where no wheat formerly grew, but then their numbers were few, and their depredations trifling. When they arrive at a field of wheat, before it is in the ear, they conceal themselves among the foliage, within a foot of the ground; and as soon as any of the ears have appeared with one side out of the sheath, the female flies ascend to the ear about 7 or 8 o'clock in the evening, and commence laying their eggs. A trunk is protruded after they fix themselves on the glume, the point of which is much finer than a hair, and is thrust with unerring aim within the glume, and reaches to the stigma, where compact clusters of eggs, amounting to from six to fourteen in each, are laid imbedded in a gummy substance; and there are frequently three or four such clusters within one glume. From the moment the eggs are thus laid, vegetation ceases; the anthers do not expand, and the filaments that support them appear glued to the chaff; the stigma continues to appear fresh, and the anthers retain their fresh colour till within nine days from the eggs being laid, when the caterpillars appear fully formed, of a whitish colour, which ultimately turns to a bright sulphur. They then devour the embryo grain. The flies do not live above three days after they have laid their eggs. They continue their labours, if the weather is mild, from 7 o'clock at night till 5 or 6 o'clock in the morning. When the ear is fully developed, and about an inch above the sheath, the fly never attempts to lay its eggs,—perhaps the glume is there too hard or close for admitting its delicate trunk. Some of the flies linger on the ear till death arrests them; and naturalists suppose that their trunk is held by the gummy substance which they deposit with the eggs. As soon as the operation of laying the eggs is over, the trunk, unless so held, often collapses again within the body, but if the fly is exhausted, it dies with the trunk protruded in a curve. It has two beautiful white wings, with a yellow plump body, and seems very delicate.

In a paper which appeared in your Journal on this subject (vol. i. page 295), an account is given of an ichneumon which

deposited its eggs in the body of the caterpillar. Soon after the caterpillars are fairly formed, the wheat ears swarm with this black fly, but few get at the maggot. On opening one of the glumes, this black fly comes feeling its way, for it seems either blind, or so stupid as not to know by sight the object of its search. It will pass groping with its feelers within a hair's breadth of the maggot, and, in returning, the moment one of its antennæ touches the caterpillar, it instantly curves up its little body into a semicircle, and darts an egg into any part of the maggot with which it first comes in contact. This operation I fear gives more pain to the maggot than your intelligent correspondent seems to suppose, for its writhing displays all the symptoms of agony.

About three weeks from the time the eggs were laid, the maggots began to disappear from the ear. To trace them to their winter quarters I deemed a most important object, as I conceived it was then they could be destroyed; and as I had observed no writer on the subject who could point out their habitation, I secured some ears in a glass case, with the stalks inserted through white paper in moist sand, that the ears might retain their freshness to feed the worms while food was necessary; and, if they descended, I expected to see them on the paper above the sand. As soon as I observed them disappear from the ears in the field, I examined the ears in my glasses, which I found were all empty. On removing the paper, none appeared on the surface of the sand; but, on stirring it with a pen-knife, myriads appeared coiled up within one-eighth of an inch of the surface, apparently in a torpid state, exactly beside the holes where the stalk had been inserted through the paper. I then went into a field of wheat and discovered some in the act of descending, which they did with seeming force, and in half a minute after their descent in this manner, they were out of sight in the earth: a few appeared unable to penetrate the surface—these, I supposed, had been the prey of the ichneumon. On stirring the surface of the earth, I found many of them in a semicircular form, within half an inch of the surface, but I found none congregated like those in the glass.

From what has been stated above, it appears that the fly is

a native of this country, and consequently formed by nature to resist our winter frosts. Were it otherwise, the same instinct that prompts the animals to seek for refuge below the surface, would have taught them to penetrate deeper to avoid the effects of frost. Finding also that where they had not been ploughed down last year in fields sown with grass, they survived the winter, though at one time the mercury in the thermometer stood as low as 18°, I conceive that any attempt to kill them by exposure to frost would be unavailing.

Having succeeded in burying other caterpillars of larger growth, I have no doubt but that the wheat-fly maggot might be also got and kept under. This could be easily performed if, in ploughing the wheat stubbles, a scarifier or skimmer were fixed on the beam before the coulter, of such construction as would cut and lay about an inch of the surface in the bottom of the furrow; if this were done correctly, and the subsequent ploughing kept so shallow as not to touch the buried surface, it is not likely that the maggots could work their way up through the superincumbent soil. Where grass seeds are sown with wheat, this would be impracticable; but the sowing of the grass-seeds might be deferred, and some other green crop in the mean time substituted. This deviation from the ordinary course, when wheat is followed with grass, would be attended by some loss, but not equal to what might be inflicted by the fly, if let alone. When grass does not follow wheat, the process is as easy and simple as can be devised.

I have thus given a brief account of the insect, and proposed what appears to me to be a simple remedy. Circumstances connected with temperature may probably occur to render such precautions less necessary; but this surely does not afford a reason for incurring further loss, when a remedy can be resorted to. I am, &c.

13th October 1829.

ON THE TREATMENT OF CATTLE IN WINTER.

TIME was, and that not very distant, when prime fed beef was not to be got for love or money in Great Britain. The sirloin indeed might grace the royal table, and the boards in the feudal banquet-halls might groan under the weight of noble barons ; but, grateful as these may have been to palates which knew not more delicate fare, they could have never been compared, in richness and flavour, to the prime fed beef of the present century. Then cattle could only get any feeding at all in summer ; and in winter they were starved on straw and water. A great part of the ensuing summer was spent in recovering from this state of starvation. In the end of autumn, when the cattle had all the beef upon them which they could acquire, and lest they should lose even that little in winter, they were slaughtered in numbers, and salted for winter use ; so that fresh beef could only be obtained in summer, and salt-junk was every man's portion in winter. Now, on the other hand, fresh beef can be obtained in the highest perfection at all seasons. Not only do the ribs " covered " still impart a relish to a feast, but we have the certainty of being able to obtain a roast sirloin whenever we please. In summer, our cattle luxuriate in rich pastures, full of ease ; and in winter they have abundance of succulent food, capable not only of maintaining what flesh had been gained in pasturage, but of increasing, in a superior degree, the fattening condition of the whole carcase. So great and so important a change in the treatment and condition of cattle has been mainly effected by the introduction into our husbandry of the cultivation of a single root,—the turnip. Such is the vast revolution and reformation which this single plant has effected in the rotation of crops, the fertility of soils, the richness of pastures, and the treatment of live stock, that our wonder at its properties is yet excited by reflection, amidst our daily experience. What a source of wealth has this plant been to our land ! Lord Kames, whose agricultural writings it is always delightful to peruse, even where improved practice has made many of his opinions obso-

lete, thus writes with enthusiasm on the importance of the turnip: "It animates me to have opportunity for giving directions about a crop, that the best farmers in this country have now taken into their plan of husbandry; and that does not altogether escape even small farmers. No person ever deserved better of a country than he who first cultivated turnip in the field. No plant is better fitted for the climate of Britain, no plant prospers better in the coldest parts of it, and no plant contributes more to fertility. In a word, there has not for two centuries been introduced into Britain a more valuable improvement *."

As the value of the turnip is so well known, and its cultivation in this country so general, one might expect to find, if not encumbrances on, at least practical directions for, the proper application of it, in agricultural writings; but on looking into the works of several esteemed authors, we were forcibly struck with the meagerness with which this important subject is treated by all, and the contradictions which abound among many of them. Mr Brown, in his *Rural Affairs*, merely says a few words on the consumption of turnips by cattle and sheep. The author of *The Complete Grazier*, whilst he gives the most minute directions how to fasten oxen to the yoke, does not condescend to inform us how to fatten them for the use of man. In the *Husbandry of Scotland*, the comparative profits derived from feeding cattle and sheep only are treated of. Mr Loudon, in his *Encyclopædia of Agriculture*, exhausts the subject by a few general remarks on the food, cleanliness, comfort and health of cattle. Even Mr Culley is totally silent on the subject. And whilst the information which these authors impart is so meager, they disagree very much among themselves as to the mode of feeding cattle. Lord Kames strongly recommends the feeding of cattle at the stall, instead of open courts, with sheds, because he conceives the latter too cold for cattle, and because the dung in the court being tramped on by the cattle, is prevented from undergoing fermentation, as if it were proper to allow dung to undergo a continued fermentation. Sir John Sinclair

* Gentleman Farmer.

and Mr Loudon seem rather to prefer the small sheds and courts for feeding cattle in. Sir John also thinks that cattle may loathe too much rich food at a time ; whereas Lord Kames says, that his instructions are intended to make cattle eat the greatest quantity possible. Dr Coventry says, the quantity of good "aliment necessary to fatten an animal when young, is found to be much *greater* than what would be sufficient to do this when it is more advanced in life*;" whereas Mr Loudon observes, that "in young growing animals, the powers of digestion are so great, that they require *less* rich food than such as are of mature age†;"—and Mr Young remarks, that "it is not right to keep yearling calves and two year olds together, *because* the younger the cattle are, the better they should be fed‡," not because of the obvious reason, that the older would drive about the younger cattle. Dr Coventry seems to consider the giving of rich food to young growing cattle, except for the purpose of improving the breed, as wasteful ; and "pampering," as he terms early feeding, he says, "prevents the whole animal from becoming coarse and large||;" and Mr Culley rejoices, "that the small boned, true proportioned cattle, are the very sort that produce more fine than coarse, that lay their fat upon the valuable parts, and always feed in much less time than the big boned coarse set§." "To produce the most perfect formed animal," says Mr Cline, "abundant nourishment is necessary from the earliest period of its existence, until its growth is complete¶."

Such diversity of opinion among authors on the same subject, would mislead any one desirous of learning the practice of feeding cattle in winter, from the writings of men who have been considered competent to give their opinions on agricultural subjects. This diversity of opinion, however, cannot arise from the difficulty of the subject, for the principle of feeding cattle on turnips in winter, is fully as simple as any other that we know in husbandry. The applying of this principle to practice, is, we grant, not so easy a business ; not, however, on ac-

* Remarks on Live Stock, p. 73.

† Encyclopædia of Agriculture, p. 303.

‡ Farmer's Calendar, p. 18.

|| Remarks on Live Stock, pp. 19. & 70.

§ Culley on Live Stock, p. 190.

¶ On the Form of Animals.

count of the difficulty of the practice, but of the continued and unwearied attention which is required. Patience and industry ought to be the prominent characteristics of the man who undertakes to feed cattle. Indeed, the practical operation must be well attended to, else much of the labour bestowed will be thrown away. This loss will appear not only in the shape of the wages of those who have had charge of the cattle, but in a much greater degree in the comparatively less value which the cattle will realize, from a scantiness of condition. As the subject is not intricate, and as so much diversity of opinion exists among writers on it, we apprehend the principle which ought to regulate the treatment of cattle in winter, has not been properly kept in view by them. It has, therefore, occurred to us, that a few observations illustrative of that principle, before we begin to describe the practical part of the operation, may not be unacceptable to the reader.

At whatever rate of rent a farmer may hold his land, it is very obviously for his interest, as a matter of profit, to regulate the treatment of his cattle in winter, by the principle of bringing them, as soon as possible, to maturity, and of keeping them, after that period, as short a time as possible in his possession. This is a principle in economy which no one will be disposed to dispute; and it gives rise to many questions which we cannot at present illustrate at length, such as,—What breed of cattle comes soonest to maturity? What mode of treating the cattle themselves will bring them soonest to maturity? What rotation of cropping will command the greatest quantity of food for bringing cattle soonest to maturity? and, Under what system of husbandry, as affecting the reciprocal assistance which stock and crop afford each other, will cattle be brought soonest to maturity? These are all important questions in themselves; but the answers to them all form corollaries to the general principle, That the sooner cattle are brought to maturity, and disposed of, the more profitable they are to the farmer. It is only one of these questions which we now mean to illustrate and follow up, with the practical directions which will ensure a satisfactory and palpable answer to it, namely, What mode of treatment should the cattle receive, in order to bring them soonest to maturity?

Now, as food is the only means we possess in winter of increasing the weight and fatness of cattle, it would appear reasonable to say, that the more nutritive that food is, and the greater the quantity of it which is given to the cattle to eat, the sooner they will come to maturity. The physical effect which generous keeping has in altering and improving the disposition to fatten, which cattle exhibit, is thus stated by Dr Coventry :—" The truth is, early pampering in the case of the lower animals, not otherwise than with the human race, occasions a delicacy of constitution, prevents the bones, and consequently the whole animal, from becoming coarse and large, and induces, in early life, the habit and appearance of old age, which consists in a set, square make, and a disposition, more or less, to turn fat. The chief art in improving a breed, so far as the food is concerned, and if refinement be the improvement wanted, lies, it would seem, in supplying it with rich provision from its earliest life, during all seasons, and in a favourable and not exposed situation *." Abundance of food improves the fineness of the bones of cattle, and a fine bone is a sure sign of a good feeder, as justly remarked by Mr Culley. And yet it seems to be a favourite rule with most writers, to recommend rich and plentiful food for calves, and for cattle which are to be fed off; but to give coarse food to those which are in progress of growth toward their full stature.

It may be here remarked, that coarse food ought not to be found on a well cultivated farm. Straw and water, in an agricultural sense, are not food at all. Straw given to cattle, with the view of being consumed as their only food, is just so much straw wasted, and time lost, in the forwarding of their condition. A limited supply of turnips will keep cattle alive, and may prevent them from falling off in flesh, but it will never bring them to a state of fatness, though they were to eat in that manner for any length of time; whereas, a moderate quantity beyond this limited portion, would constitute abundance. But the truth is, farmers need not be advised to limit the quantity of food to their young cattle; for the general scantiness of winter succulent food, on most farms, creates the necessity for giving them a limited supply of it. A scanty supply of food to cattle

* Remarks on Live Stock, p. 70.

produces that uneasiness which may be supposed to arise from unsatisfied appetite; and, as some of them have forward dispositions, they will certainly take the advantage of their more gentle neighbours, and deprive them of most of even their scanty supply. The fear which is continually upon the latter, of being driven about, dejects their spirits, and exposes them to cold and wet, as well as hunger—hence the origin of many pulmonary diseases among cattle. Whereas, if food is given in abundance to young cattle, they are quite contented among themselves, and able to endure every inclemency of weather.

These evils arise solely from overstocking. It is probably the same with the animal, as with the human economy, that population always presses hard on the means of subsistence; but the power of control is greater over the undue increase of the former than that of the latter. Overstocking is a fault, the remedy for which is in the breeder's own hands. In fine seasons, when food is abundant, cattle of all ages get it plentifully; but when an unfavourable year as to vegetation arrives, and which is no uncommon occurrence in this country, the same number of cattle has to be maintained on a less quantity of food. But, in fact, it would be much more profitable for the farmer to rear or buy, if he does not rear them himself, no more cattle than he has food to support in affluence; and, though this might lessen the number of cattle in the country, the remainder would be much better fed, and they would increase as much in bulk and weight, as would make up for the deficiency of number. There would, at all events, be fewer lives to risk the loss of, better beef in the market to be bought, and the condition of the poor people would be improved by the use of the extra fat alone, which they would eagerly buy, as they do not consider it thrifty to buy lean meat even at a little reduced price. Butchers know how much more readily poor people will buy fat Leicester mutton, than the Highland mutton which is generally exposed for sale, merely because it is fatter, and goes a greater length with them in cooking. Hence on the score of profit to the farmer, humanity to the poor people, and ease and comfort to the cattle themselves, abundant nourishment ought to be given to cattle from the earliest period of their existence, until their growth is complete; and this growth to ma-

turity is hastened by the consumption of rich food taken in abundance.

Whether the cattle are bred on the farm, or bought in for the purpose of feeding, the treatment of them in winter ought to be the same. Cattle may be fed in the house, or in the open air. If they are to be fed in the house, byres with stakes, chains or binders, and mangers, must be fitted up for them; and if they are to be fed in courts, whether large or small, sheds are necessary for shelter at night, or in very wet weather. Farm-buildings are generally so constructed as to embrace an open space of ground within them. This space is called a court, which, divided into two if large, or in whole if small, forms good accommodation for cattle. If a series of small courts are built by themselves, each to contain only a very few cattle, they are provincially called hammels. To be complete, both kinds of courts must have shelter-sheds attached to them. On a breeding farm the calves and one-year-olds are put into the large courts. In such cases, calves may do together to the amount of twenty, though they are certainly better when divided; but in the court, which is occupied by the one-year-olds, it is not advisable to allow above ten of them to be together, as at that age they are very apt to drive one another about. The two-year-olds, which are to be fed off, are put into the byres or hammels. If the cattle are bought in, the younger ones, if any, are put into the large courts; and the older ones, for feeding of course, into the byres or hammels. In the byres each stall ought to be at least four feet in width, and seven feet in length, for the proper accommodation of an ox which will feed to sixty or seventy stones, and the manger ought to be about eighteen inches above the ground. A hammel, with a shed seventeen feet in width, and fourteen feet in depth, with a court, including the trough, twenty-one feet by seventeen, will easily contain three oxen of sixty or seventy stones each, or four smaller sized cattle; and if the dimensions were a very little larger, it would easily contain four of the heaviest cattle. Byres, hammels, and courts, are not completely fitted up, unless they are constantly supplied with pure water at the command of the cattle. It is true, feeding-cattle will not drink much water on a full allowance of turnips; but in the spring months,

when the days are longer and the food drier, they will assuredly drink water. Before taking possession of the byres and courts for the winter, it is necessary to litter them well with straw, both in the open courts and under the sheds. This first littering should be an ample one, as it will form a sort of drain to carry off the superabundant moisture afterwards. Urine drains may be built from the courts and byres to a well which will retain the superfluous quantity, and out of which the urine can be pumped into a barrel, and carried away to top-dress new grass. If the cattle have never before been tied to a stake, great care is necessary at first to induce them to go up to it. A few turnips thrown into the manger is a very good enticement. If gentle means are used, there will be little difficulty in getting the binder or chain round their neck. It should at first be pretty tightly fastened, especially if the cattle want horns, as it gives them less liberty to struggle, which they will most likely attempt to do the first time they find themselves fast. It is necessary at this time to watch them attentively, in case of any of them choking, or hanging back, or attempting to turn round in the stall, the effect of which seems to be to impress the animal with a sense of fear, and to check its improvement for a considerable time afterwards. In the courts the cattle should be allotted according to age, strength, and disposition. A mistake may at first be committed in this respect; but it is easy at any time to remove the turbulent or the timid one, and place it among more befitting companions.

In the byre, the first thing to be done in the morning is to take away the dung from behind the cattle, and put it in heaps in the urine-canal; and then to give them their allowance of turnips. Some people prefer giving straw to the cattle before the turnips, from the idea, but a mistaken one, that the turnips are too cold for their stomachs when hungry; but cattle will eat very little straw when in the expectation of receiving their turnips in a short time, and it is an error to damp their appetite in the morning with a substance that will at best cheat their hunger: besides, the practice gives unnecessary trouble to the man in giving the straw, and taking away any which may be left, before bringing the turnips. Indeed day-light is short enough in winter to allow time for cattle to eat a sufficient quantity

of turnips, so that they ought to be given to feeding cattle betimes in the morning. The heaps of dung can be wheeled away in a barrow to the dung-hill during the time the cattle are eating their turnips. We have advised the removing of the dung from them before the giving of turnips, as at that time they should not be unnecessarily disturbed; and cattle, at their first feed especially, are extremely jealous of any thing approaching them, and may strike out with head and feet. At the hammels and courts, the first thing that should be done in the morning by day-break, is to clean out of the troughs with a spade any refuse of stems or earth that may have accumulated since the last foddering; then to give a hearty allowance of turnips. Fresh straw, for fodder, may be given about the time the turnips are eaten up, a small quantity being placed before each beast in the byre, and in the racks under the sheds of the courts. Oat-straw is found to constitute the best fodder for cattle; and potato oat-straw is perhaps better than that of the common oat, as the former is always cut down before it is quite ripe. Hay is, no doubt, better than any kind of straw; and those who have abundance of that desirable fodder may give it ungrudgingly to cattle, in the certainty of being soon repaid its value.

But in ordinary circumstances it is impossible to supply hay to the cattle, where a number of horses are to be supported in high condition for the spring-work. In the thrashing of the crop for the supply of straw to the cattle, it should be so managed as that there should be always on hand at the same time, barley or wheat straw for litter, and oat-straw for fodder. With feeding cattle, the remains of the fodder-straw may suffice for litter; but, when fodder straw is scarce, the quantity of fodder given may be lessened, in order to save it for its own particular purpose, and the litter made of barley or wheat straw. If there be plenty of oat-straw to spare, this precaution will be the less necessary. Turnips should be given again about mid-day to the feeding beasts, and if there be not full turnips for all the cattle, those in the courts may now get a little more straw or barley-chaff, which will be very acceptable to them. Cattle are exceedingly fond of bean-chaff, or the wet litter from the stable. As it is always desirable to give calves as much succulent meat as they can eat, for it is not profitable to hunger them in the

"calf skin," the year-olds may be pinched a little in their allowance, particularly in the dull short days of winter. But in order to afford them any little advantage in lieu of their turnips, it is a very good arrangement to put them in that court which receives the refuse of the stables, in order that they may pick up any tufts of hay or wetted litter which may happen to be thrown out. This liking for the straw which has been wetted with horse-urine, contributes to establish the belief that salt might be a good condiment in the food of cattle, for whatever they eat with gusto, may be supposed to do them good. The last allowance of turnips in the short winter days should be given about three o'clock in the afternoon, or a little after it. In the byre, after this allowance is eaten up, the mangers should be cleaned out before giving another foddering of straw. A trowel will be found a handy instrument for this purpose. At the hammels, the last foddering of straw can be given any time after the last allowance of turnips, which should be ample, as the cattle will come backward and forward to them even in the dark, and in moonlight they will feed as well as during the day. The calves should be served with turnips immediately after the feeding beasts; and the year-olds can also get a few at this time to complete their day's allowance. Between the allowances of turnips, litter should be sprinkled in the byre and hammels, to induce the cattle to lie down after repletion to chew the cud, which they will invariably do. At eight o'clock at night, the byres should be looked at with a light, and the cattle supplied with fodder if necessary, and their bed made comfortable for the night, by drawing back any dung, sprinkling some more litter, and shaking it well up with a fork. At the hammels, if it is moonlight, some more turnips should be thrown, even at this time of night, into the mangers. During the day, the water-troughs should be all kept full of fresh water, and any filth that may have been blown into them by the wind should be removed. When the frost becomes so severe as to harden the turnips, they should no longer be brought from the field, but from the store formed of them in the beginning of winter, for the purpose of supplying the cattle with fresh turnips during the continuance of frosty weather; nor should any more be taken even from the

store than what can be consumed in a day. Frozen turnips may be thawed by being placed in a tub of cold water; but this is a very tedious and troublesome mode of obtaining fresh turnips in frosty weather, compared to the excellent practice of storing a considerable quantity in fresh weather.

In the feeding of cattle, it is of the utmost importance, that the man who has the charge of them, should be very attentive to his duty, and in particular that he should be exact, even to a minute, in supplying them with turnips. Cattle know perfectly well when the time arrives for a fresh supply, even though the mangers in the hammels may not be empty, which they should never altogether be. When they are supplied with food at irregular times, they will either crave it, or become careless about it, and from uneasiness, arising from frequent disappointments, they will not feed so pleasantly and speedily as when their food is placed before them at exact periods. When the man thus regulates his different works by time, he will find leisure moments during the day to perform many necessary acts, which, though they may appear of little importance in themselves, nevertheless contribute greatly to the appearance of neatness and comfort in the farm-yard, and its inmates. Thus, he might spread the stable litter along the edge of the turnip-troughs of the year-old cattle, to keep any turnips clean that may have been pulled over by the beasts; for when cattle are first put up to feed, the freshness and tenderness of the leaves, induce them to eat these first, and in the anxiety of each to obtain another fresh bite, many turnips are necessarily pulled over; and he can shovel and scrape together any mud about the causeways and the places on which the turnips have been laid down from the field. He can frequently examine the skins of the cattle, and give immediate notice of any eruption; for cattle, after being a month or six weeks on turnips, get very itchy in the skin, the violent rubbing of which, often causes ulcerated spots to break out, but which can easily enough be cured at first, by an application of a decoction of tobacco, with a little spirit of tar. He should rub those parts of the body which they cannot easily get at to lick with an old curry-comb, and scrape off any dung that may ad-

here to the hair in the hinder and under parts of the body with a large blunt knife; and this attention is more necessary at the beginning of the season than afterwards, as the freshness of the stems, and the juiciness of the roots of the turnips, and the greediness which all cattle evince for them at first, cause a looseness in their bowels. He should observe the first indication of lice on their skins in the early part of the spring: these may be easily destroyed, by applying to the affected parts a solution of mercurial ointment; but, if neglected, they will cause much uneasiness to the cattle, making their hair peel off, and exposing to view an unsightly skin: and he may handle them frequently on every part of their body, as they are very fond of being handled when they are rising in condition, and in order also "to accustom them to the too frequent intrusion of man," (which Mr Loudon deprecates), as cattle, when they have been accustomed to be handled, will stand better, and show themselves more satisfactorily to the buyer; and there is something so winning in a gentle disposition in powerful animals, caused by good treatment, that a buyer will prefer them, when they have to be driven a distance upon the road; and the butchers in the neighbourhood will also prefer them, as they will walk peaceably to the shambles, without the risk of being raised to a frenzy. All these constitute the minutiae of the business of feeding cattle on turnips in winter, and trifling as they may appear, attention to them will amply repay, in the shape of prime beef and docile cattle, all the extra labour bestowed. The whole may be easily accomplished by any man who regulates his movements by the watch; and the man who has the charge of cattle in winter that will do this, whether he is seen by his master or not, is an inestimable servant.

The quantity of turnips which feeding cattle will consume, as stated by most writers, nearly accords with our own experience; namely, that about one ton will be consumed every week by an ox of from 60 to 70 stones, or about one acre of a fair crop of turnips in six months. Thirty-three double horse cart-loads of turnips, each weighing from 16 cwt. to 18 cwt., are a good crop on light sharp lands. We have frequently had that

quantity. An acre of good turnips, with straw, not in the immediate neighbourhood of a town, will fetch L. 5; and an ox that has been well kept all his days will increase 20 stones in six months, which, at 6s. 6d. per stone, will produce L. 6, 10s.

If the second growth of grass has continued fresh till the latter part of autumn, cattle may be soon enough put up to feed by the first of November; but if the grass fail sooner, which it will in most seasons do, the middle of October is late enough for putting them up to feed. White globe turnips are an excellent juicy food for cattle till the new year, after which should follow the yellow or green tops, for two months longer, and then the Swedish turnips will finish the season. If the Swedish turnips have been stored up before the second growth of the stem has made its appearance in spring, they may be taken out quite fresh till the beginning of June. Since the cultivation of the potato has increased so rapidly, within these few years, many people now feed their cattle on it in spring, either wholly or mixed with turnips. When cattle are fed on potatoes, attention ought to be paid after feeding, for fear of internal swelling. When observed at first, the swelling may be allayed by pouring down the throat a bottleful or less of common whale oil, which will check the fermentation, and operate as a purgative. Should any of the young cattle or the feeding beasts in the byre choke on a piece of turnip, for those fed in hammels never or very seldom do so, the best expedient is to use the probang at once, rather than permit the throat of the poor animal to be squeezed in attempting to push the piece of turnip up or down, and so inflaming the throat. The probang may be used with great success, by causing the animal to be forcibly held by superior strength, with its neck and mouth stretched forward, and whilst one is pushing the instrument gently down, another is directing the end of it down the gullet on the outside of the neck. When the object of obstruction is pushed down into the stomach, let the instrument be gently drawn out, and if, during the operation, the animal forcibly twists its head about, the instrument should instantly be let go. Feeding cattle will eat very little straw; but they ought to have abundance of litter at all times.

Before concluding, we may say a few words on the comparative merits of feeding cattle in hammels and byres. Our decided predilection is in favour of hammels. In them the cattle are at perfect liberty to roam about, if disposed for exercise: they are exposed to all the sunshine there may be in a winter day, and the very rain which falls on their backs titillates the skin, and causes them to lick and clean themselves; they are comfortably warm in their shed among an abundance of straw in the coarsest night, and cattle will never suffer from cold, when they have a comfortable shelter to which they can repair at will; they can come and go to their food whenever they please, night and day, and their meat being constantly in the open air, it will be always fresh and sweet; and their feet and hair when they come to travel are quite able to bear the hardness of the road, and the coldness of the air. These are all advantages which no byre can confer. Nor are the hammels so expensive in their original erection as many represent them to be. We have seen a range of them, consisting of five divisions, capable of feeding twenty large oxen, erected for L. 20; but these had no regular roof. The roofing of all buildings is the most expensive part of them. The roof of those to which we refer, consisted of trees laid across as beams about a foot asunder, the space between them being filled up with the branches of the spruce and Scots fir. Such a place was a choice one for stacking pease or beans upon. To this purpose it was often appropriated; or it was covered with straw roped down, which was used as bedding for the cattle in the first part of the succeeding season, when fresh straw was put in its stead. In the hammels which faced the south, the cattle were well fed and comfortably lodged, and no byre could have afforded so much accommodation at the same expense.

H. S.

ON A COMBINATION OF GRASSES FOR ALTERNATE HUSBANDRY.

By Mr PATRICK SHIRREFF, Mungoswells.

IN the beginning of April 1828, the following quantities and kinds of seeds, viz. 140 lb. of red clover (*Trifolium pratense*), 65 lb. of white (*Trifolium repens*), 28 lb. of yellow (*Medicago lupulina*), 2½ bushels rye-grass (*Lolium perenne*), 8 bushels cock's-foot (*Dactylis glomerata*), 4 bushels hard fescue (*Festuca duriuscula*), 85 lb. cat's-tail (*Phleum pratense*, major), were mixed together, and sown on 14 Scotch or 17·656 imperial acres of land; at the same time, 10 lb. of red clover, 5 lb. of white, 2 lb. of yellow, and 2 bushels of rye-grass seeds, were sown on one Scotch acre near the centre of the field on which the former mixture of seeds was sown. The soil is a heavy but not a clay loam, incumbent on a retentive subsoil: at the period in question it was in a high state of cultivation, and sustaining a crop of spring-sown wheat a few days above ground. To guard against mistakes, I myself mixed and sowed the seeds, which were rolled with a heavy roller. On reaping the wheat crop, the grass plants were thickly set in the ground; they grew vigorously, and in autumn were depastured with cattle, when the ground was in a dry state. The grasses were sown for pasturage, but circumstances ultimately induced me to devote them to the scythe.

On the 1st of May 1829, the field presented a fair appearance, and the ridges sown with the seeds of clover and rye-grass, from the early growth of the latter, were seemingly clothed with the most herbage; the clover soon overtopped the rye-grass, and the ridges might have been distinguished by their colour from the rest of the field, as far as the eye could discern objects. Before the end of the month, the crop from the general mixture of seeds, equalled in height that from clover and rye-grass. The culms of cock's-foot, hard fescue, and cat's-tail, rose in succession, and greatly exceeded in height those from red clover.

The mowers began to cut down the crop on the 29th of June. At this time the seeds of rye-grass were matured, while red clover, cock's-foot, hard fescue, and cat's-tail were shedding their blos-

soma. To a casual observer, the crop on the ridges sown with the seeds of clover and rye-grass indicated extreme luxuriance, and seemed to exceed in weight that on the rest of the field; but, on close inspection, the prostrate state of these ridges was evidently owing to the clover having overpowered the rye-grass, and been beaten down by the weather, while, on the other part of the field, the high and numerous culms of cock's-foot, and cat's-tail in particular, supported and concealed from view the strength of the red clover. The hay-crop, from clover and rye-grass, was found to be thinnest on the ground, lightest on the scythe, and inferior both in quantity and quality of produce. The second crop or aftermath of the mixed grasses, both in earliness and quantity of produce, was superior to that of the clover and rye-grass. In the middle of August, a portion of the aftermath from both crops was cut, and the produce of the third crop of the mixed grasses was still superior to the clover and rye-grass. Towards the end of October, the aftermath, springing from time to time from the second cutting of clover and rye-grass, obtained a superiority in colour, and perhaps also in produce, over that on the other parts of the field, a circumstance which I attribute to the young foliage of rye-grass enduring cold better than that of cock's-foot, fescue, and cat's-tail, and to a peculiarity of growing to a late period in the season, which some varieties of rye-grass possess.

The rye-grass seed sown in the experiment is much esteemed in this neighbourhood, and known by the name of Dickson's variety. The quantity of half a bushel of rye-grass, with a mixture of clover-seeds, has been found by experience to be an ample allowance for a Scotch acre of land, when the seed is of fine quality and highly dressed, as was the case in the present instance. The rye-grass was conspicuous for growing early in spring, as well as late in autumn, and remaining comparatively unproductive in the summer months.

The cock's-foot, throughout the season, put forth new leaves with rapidity after being cut with the scythe, and produced culms to the hay-crop only: the fescue planted thinly, and also grew rapidly after being cut; the cat's-tail was later in producing flower-stalks than the other grasses used in the experiment, and after being cut, did not put forth new leaves so rapidly as the

cock's-foot and fescue; but in every instance it produced numerous culms, which blossomed at the same time as the red clover, and where a part of the field was four times mown, yielded a rich crop of culms to the last cutting. It was intended to have sown a quantity of the seed of the rough-stalked poa (*Poa trivialis*) with the other seeds, but the house of Cormack, Son, and Sinclair of New-Cross, which furnished the seeds, sent but 20 lb. of *Poa trivialis*, a quantity too limited to enable me to mark satisfactorily the characteristics of the grass. A few plants of knot-grass (*Holcus avenaceus*) appeared in the field previous to the cutting of the hay-crop, and their luxuriance led me to augur favourably of this plant. Here it may be proper to remark, that the knot-grass in question, and which is figured in *Hortus Gramineus Woburnensis*, is different from the knot-grass which infests the cultivated fields of Scotland, and which is one of the most troublesome weeds that farmers contend with. The bulbs forming the roots of this variety of knot-grass, are of a very small size, and I have observed the plant growing indigenously in a sequestered glen in the neighbourhood of Dunblane.

The cost of the seeds was as follows:—Mixture of cock's-foot, fescue, cat's-tail and poa, 14s. 6d. per acre; rye-grass 3s. per acre; the clovers being the same in both cases. The produce was estimated from appearance thus:—The crop from rye-grass and clover, 320 stones of 22 lb., 16 oz. to the lb., at 5½d.; second crop, or aftermath, 120 stones, at 4½d.; total L. 9 : 18 : 4;—crop from mixed seeds, 340 stones, at 6d.; second crop, 160 stones, at 5d.; total L. 11 : 16 : 8. So that, by an outlay of 11s. 6d. per acre, an increase of produce amounting to L. 1 : 18 : 4 was obtained. It is difficult to ascertain the exact produce of an experiment on a small portion of ground, where an error of a hair's breadth in measurement, or of a scruple in weight, becomes of magnitude on the extent of an acre, and renders such attempts, like estimates of an experienced eye, but approximations to accuracy. Whatever reception this account may meet with from farmers, such is my own conviction of the satisfactory result of the experiment, that, in time coming, I intend using a mixture of seeds of grasses for the alternate husbandry.

Notwithstanding that the crop from mixed grasses evinced a superiority in the case detailed, where red clover was luxuriant and abundant, the superiority would have been still more conspicuous, if that valuable, and seemingly capricious plant, had failed to grow. In the case of pasturage, the quality of rapid reproduction of herbage possessed by cock's-foot and fescue would have been valuable under any circumstances, and it is chiefly in this branch of husbandry that a numerous combination of grasses is conspicuously advantageous*.

The effect of a mixture of grasses may perhaps be thus explained †:—

1st, *Grasses differ from each other in their habits of growth.*—Some affect different kinds of soil, put forth foliage, ripen seeds, and reach a maximum of produce at different times of the season, and periods of their existence. The habits of grasses may be illustrated to farmers, by noticing the peculiarities of clovers and rye-grasses, with which they may be presumed to be familiar. Some rye-grasses are annual plants; red-clover is a biennial, white a perennial. Rye-grass matures its seeds much earlier in the season than red-clover, and white blossoms later than red. Rye-grass is erect in growth, luxuriant in spring, and comparatively unproductive in summer; white-clover is creeping in growth, unproductive in spring, and luxuriant during part of summer and autumn. 2d, *Grasses are gregarious or social.*—This propensity, which is particularly marked in perennial varieties, becomes manifest upon inspecting permanent pastures, which are invariably composed of many kinds growing promiscuously; and in some instances, twenty species have been found growing on a square foot of surface‡. I may here mention my having, in the course of last summer, grown the seeds of a few natural grasses for William and Thomas Dods, nursery

* The influence of grasses as affecting the succeeding grain crops, is an important and perhaps neglected branch of inquiry. Farmers generally agree in thinking the effects of a rye-grass crop injurious.

† But for a full elucidation of this subject, the reader is referred to the excellent work of Mr Sinclair, the *Hortus Gramineus Woburnensis*, in which is given an ample and scientific detail of the habits and properties of British grasses.

‡ *Hortus Gramineus.*

and seedsmen, Haddington, with a view of enabling them to compete for a premium offered by the Highland Society of Scotland. It was recommended by the Society, that the seeds of the grasses should be grown separately, and I observed the superiority of the crop, near the line of separation, where the seeds of two kinds had been intermingled in sowing. Cat's-tail sown by itself on a gravelly soil, put forth a stunted stalk a few inches high, and on the line of separation, where intermingled with red cover, it attained a height of several feet, and perceptibly benefited the clover-crop. In accordance with these two laws, it will be found, that by sowing seeds of many grasses, dissimilar in their habits of growth, and arriving at a maximum of produce at different periods of summer and autumn, there is secured throughout the season a succession of fresh herbage, rendered, by the erect and creeping foilage of the different species, so dense and abundant, as greatly to surpass in quantity that obtained from the cultivation of two or three kinds only.

Vegetable substances, that have either undergone the process of natural decay, or animal digestion, form the chief source of fertility in soil, and with other bodies containing the like elements, together with air and water, may be said to constitute the food of plants. Indeed, air and water, or their component parts combined in various proportions in different bodies, may be said to sustain life, and of organic bodies the lowest in the scale of existence, may be said to be purveyors for the higher classes. The germs of the lichens, wafted by the winds, cling to the naked rock and other barren surfaces, where the plants to which they give existence, after being nourished by air and water, decay, and their remains are carried by rains to nourish more important vegetables. These again assimilate air and water, and ultimately either nurture new plants, or animal life. In short, the elements of air and water may be viewed as raw materials by which life is sustained, and vegetables, as machines manufacturing for each other and the animal kingdom. The family of grasses under management of the husbandman, forms a useful class of machinery in this universal manufacture, by furnishing the means of increasing the other vegetable productions of the farm, and supplying dairy produce, butcher-meat, and raiment for the use of man. But in order to take advantage of the

raw materials—air and moisture—so bountifully supplied by nature, the most efficient machinery must be employed. The husbandman who clothes his fields only with rye-grass and clover, employs a limited machinery, the former being unproductive in summer, the latter moderately so in spring; but when he, for this purpose, uses a variety of plants differing in their habits of growth, and periods of luxuriance, a numerous and powerful machinery is kept successively in full operation.

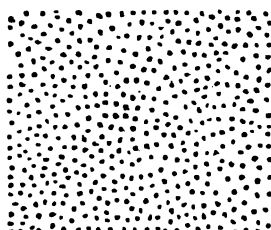
In conclusion, I may remark, that from my limited experience in the cultivation of grasses, it would be presumptuous to fix the kinds and quantities of seeds proper for sowing, and I beg to be understood, as advocating a numerous mixture of seeds generally, without deeming that used by me to be the most suitable. Rye-grass possesses qualities that are calculated to entitle it to an important place in grass-husbandry; and a combination of different species, as now recommended, must be regarded as assisting, and not as excluding, the cultivation of rye-grass.

DESCRIPTION OF A MACHINE FOR SOWING BROADCAST.

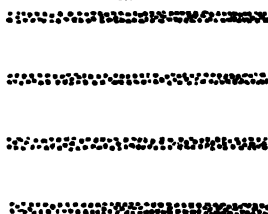
THE uses and advantages of rows or drills for such crops as the bean, the turnip, the mangel wurzel, and the like, will hardly be questioned by any farmer who has possessed sufficient means of observation. If these crops are not regarded in themselves as subservient to the production of the more valuable species, it should at least not be forgotten that this is a purpose to which they may be always made subservient, and that it is frequently the most important which they can be made to promote. The cultivation of such plants in rows, admits of the tillage of the ground during the months of summer, and the consequent destruction of weeds, in a manner sufficient to supersede the use of the summer-fallow on the lighter soils, and to render its recurrence greatly less frequent on the stronger clays. In truth, the row culture of certain green crops is one of the greatest improvements of modern agriculture, and should be extended by every effort of instruction and example. By no other means yet known to us, can so large a produce be raised from land under constant tillage, so beneficial a rotation of crops

be adopted, or so great an economy be practised in the application of manures. But, while the advantages are thus apparent, as regards the application of this species of culture to our preparatory green crops, it does in no degree follow that advantages equally great will result from its application to our crops of white corn. The analogy as regards the nature of the plants which form the subject of cultivation does not hold. The cereal grains send forth numerous shoots or suckers, and the goodness of the crop mainly depends on the vigour and number of the shoots which they send forth. The other kind of crops do not, generally speaking, tiller, like wheat, barley, or oats, but rise from one stem. Reasoning from these principles, we should infer that the former class of plants should be cultivated in that manner in which they are best suited to summer tillage—that is, in rows: the latter in that manner in which the seed is most equally deposited in the upper stratum of the soil, which is in broadcast.

Broadcast.



Rows.



The opinions, however, of intelligent agriculturists are not agreed as to the superiority in practice of the broadcast over the row system, even as relates to the cereal grains. The farmer of Norfolk, or of the light soils of Sussex, will contend as strenuously for the superiority of the row system, as the farmer of East Lothian for that of the broadcast system, and each may be right as regards the application of the principle to the circumstances of his own situation. The question which is to be settled, however, is, Which of the two systems is to be regarded as the rule in husbandry, and which the exception? Now, independently of the circumstances just adverted to, and judging only from the greater extent to which the broadcast system is carried on in the country, from the fact of the row system having declined in favour, in districts where it had once been

more extensively practised, and from its having recently ceased to make progress in general practice, we should be inclined to hold, that with respect to the cereal grains, the rule of agriculture is the broadcast system, and the exception the row system. The cases falling under the exception may be, and doubtless are, very numerous and important. There are many light soils in which the seeds require to be deposited, at a considerable and equal depth, and this the drill-machine effects better than sowing on the surface; and there are many thin cold clays which tend to throw out the plants, the best remedy for which is thought to be deep sowing. These purposes, indeed, may be served, by *ribbing* the surface, as it is termed, with the common plough previous to sowing, thus,—



The seed being sown from the hand in the common way, falls into the hollows, and is thus more deeply covered. The drill may be advantageously employed, where the land is very subject to be over-run with certain annual weeds, as the scellock or wild mustard. If the growth of these can be destroyed in the early part of summer by the hand-hoe, it may frequently save the crop. The corn-drill is therefore an instrument of much importance in agriculture, and the row-culture may, in the case even of whole districts, be preferable to the broadcast, though the latter system, we must still contend, is the most generally applicable to the circumstances of this country.

The sowing of corn from the hand, however, is known to be attended with some uncertainty, being dependent, for the accuracy of the execution, upon the skill and attention of the sower. The regularity of the work is also affected by winds; and, unfortunately, the means rarely exist of detecting the degree of inaccuracy in the work until too late to correct it. As a remedy for these inconveniences, a machine has been for some years introduced into the agriculture of Northumberland, North Durham, and some of the southern counties of Scotland, for sowing broadcast. As regards economy alone, little perhaps is effected by the employment of this machine. Its recommendation is the regularity and certainty with which it performs the work, and

the rendering the execution independent of unskilfulness or want of care in the operator.

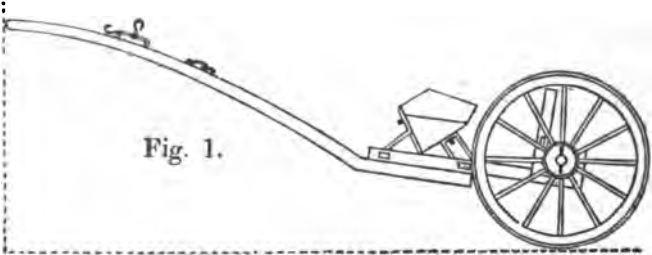


Fig. 1.

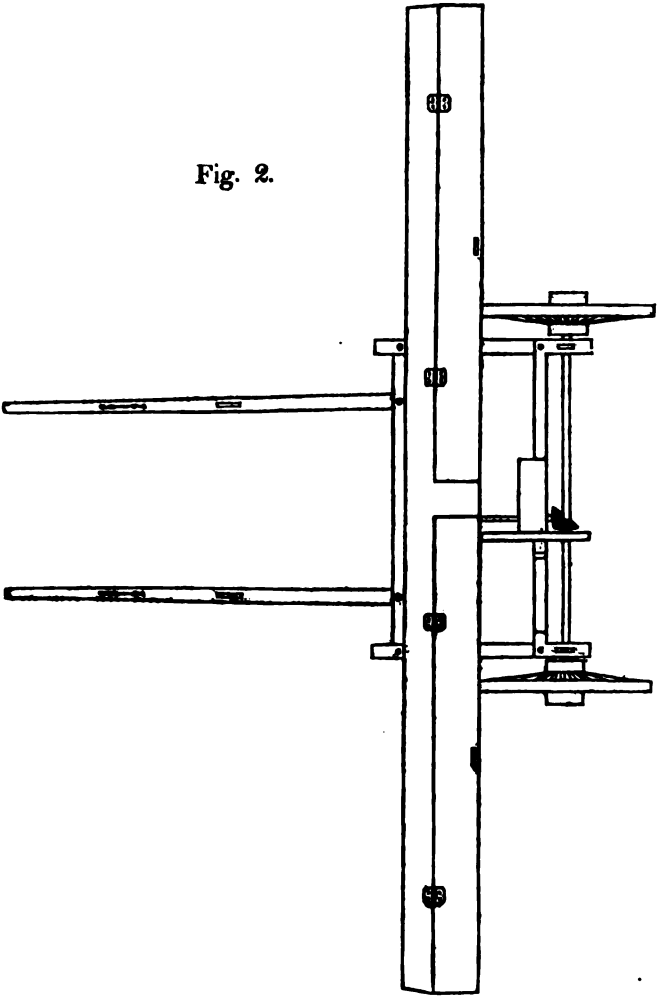


Fig. 3.

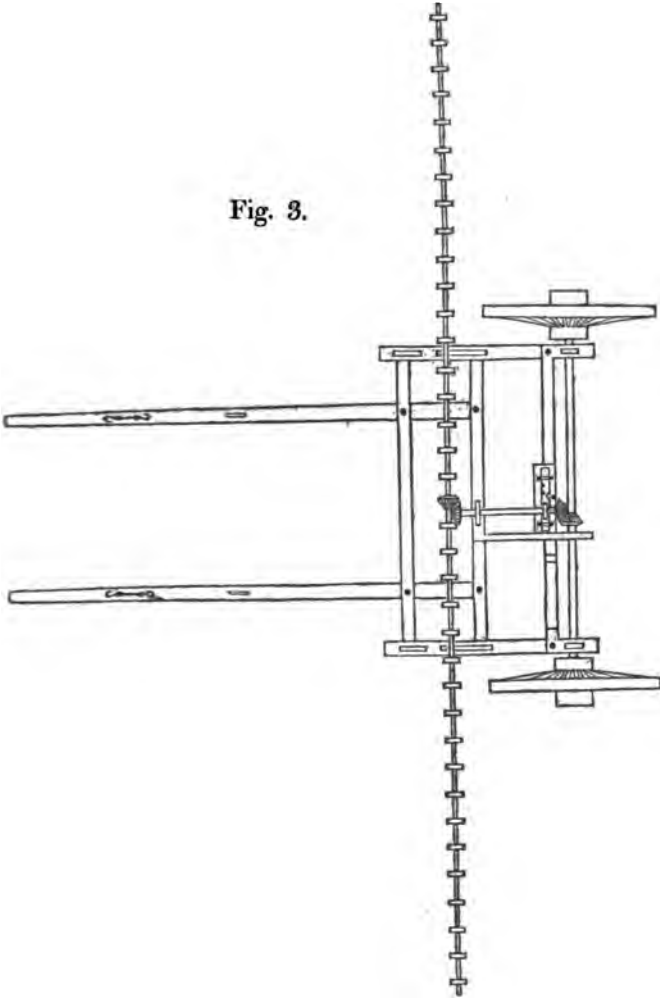


Figure 1. represents the machine as seen from the side, with the shafts in the position in which they are when the horse is yoked. Figure 2. represents the machine as seen from above, with the box upon it, the end of which is seen in Figure 1. fixed upon the frame-work of the machine before the wheels. Figure 3. represents it as seen from above, without the box. In this the frame-work of the machine, the rods or spindles, and wheels upon the rod in the interior of the box, are seen. The length

of the box is 17 feet ; and the lid is in two parts, for the greater convenience of opening when putting in the seed. In the interior of the box, nearly at the bottom, is a square rod of iron, as seen in Figure 3, on which are fixed thirty-six wooden wheels, set at equal distances, about 12 inches in the middle where the cog-wheel is fixed, being left vacant. Behind this interval, the horse walks in the hollow of the ridges, so that the machine may sow at once the half of each adjoining ridge. The wooden wheels are $2\frac{1}{2}$ inches in diameter, and $1\frac{1}{4}$ inch in breadth. Each of these has eleven teeth covered with tin *, the breadth of which is $\frac{3}{8}$, and the depth $\frac{1}{8}$ of an inch. Besides a division in the middle of the box, there are six wooden partitions in the inside at equal distances, so that, when the machine is sowing on the sides of hills or other inequalities of surface, the seed may be kept more regularly at each wheel. There is a small hole in the bottom of the box behind at each interior wheel, through which the seed falls as these wheels revolve. The wheels work in grooves in the bottom of the box, and are so near the holes behind, that the seed only falls out when the wheels are revolving. A piece of deal is generally attached to the under side of the box on the outside, which hangs down with an inclination backwards ; and the seed, by falling upon this board, is disseminated more regularly in a lateral direction. On the outside of the box, covering the holes, is a thin narrow bar of iron, in two parts, having a hole of the same size opposite each hole in the box. This bar is moved at each end of the box by a male screw working into a female one, by which the holes can be made less in any required degree, or even closed altogether. An index is attached to the end of this bar, by which the holes are adjusted as required for the different kinds of seed, so as to regulate the quantity required to be sown.

The manner in which motion is conveyed to the wheels within the box is as follows :—The axle of the two wheels of the machine is fixed to, and revolves with, one of them. A cog-

* Some machines have brushes in place of teeth covered with tin. The latter, however, are superior to the brushes ; for, when a large quantity of seed is in the box, the brushes sow thicker than when there is a small quantity ; whereas a greater or less weight of seed makes no difference with the teeth.

wheel is fixed upon this axle, as seen in Figures 2 and 3. This cog-wheel works into a similar wheel on the end of a spindle placed at right angles with the wheels of the machine; on the other end of which is a cog-wheel, which works into a wheel of the same kind on the spindle or rod on which the wheels covered with tin are fixed in the interior of the box. The wheels in the interior of the box revolve in the same way as the axle of the machine; that is, revolve upwards when passing the holes through which the seed falls out. The spindle which communicates motion from the axle to the rod within the box, is fastened at the end next the box, by passing through a socket on the middle cross-beam of the frame-work of the machine, as seen in Figure 8. On the hind cross-beam of the frame-work is an apparatus similar to that of a common door-lock, as seen in Figure 3, by means of which the cog-wheel of the spindle is, when required, detached from the cog-wheel of the axle; and thus, as no motion is communicated to the wheels within the box, the seed, as already stated, is prevented from falling out. This is necessary when the machine comes to the turnings at the end of the ridges; it is only the work of a moment, and can be performed by the person who directs the horse by reins from behind, without stopping the machine.

The box, as already stated, is 17 feet in length, which will answer for the breadth of almost any ridge, the breadth of the common ridge being generally only 15 feet; but, that the box may be accommodated to the breadth of smaller ridges, six or eight holes on each end are made to shut up by thin pieces of iron, which slide down over any required number of holes. The breadth of space which the box occupies when on the machine would render it inconvenient to convey it through gates and from one field to another; but the box is then placed between two upright posts on the right side of the machine, and lies forward by the side of the right shaft.

A man and a horse with this machine will sow between twenty-five and thirty acres in a day. The regular manner in which the seed is disseminated renders less seed necessary than in the common method of sowing by the hand. Besides the advantages arising from a saving of seed, the greater regularity, as

regards their distance from each other, with which the plants spring up, generally renders the crop superior to that sown in the other way. The machine has been described as adapted to the sowing of the common sorts of grain; but it is equally well calculated for sowing the cultivated grasses. The price of a machine is about L. 8.

ON WEIGHTS AND MEASURES.

THE subject of Weights and Measures has acquired more than usual interest, from the passing of the recent act of Parliament, and from the means already taken to carry it into effect. It is thought, therefore, that a short account of the objects sought to be obtained by the act, will prove acceptable to the reader.

Measures have, apparently, been derived originally from some part of the human person, and the designations, a foot, a pace, a palm, and some others, seem to be general over the world. It seems likely that these, in the ruder states of society, had been taken by each individual from the magnitude of his own person, and that it was not until the inconvenience of the diversity thence arising, came to be felt in the gradual progress of society, that a mean or standard length would be established by authority or general consent. As might be supposed from this origin, the measures to which the same names have been applied by ancient or modern states, come somewhat near to each other, though almost none of them are precisely alike.

This, however, from the description of commercial dealings between independent states, would be of little importance, did a strict uniformity prevail, in the corresponding weights and measures, throughout all parts of the same states, which is far from being the case. And, although to that extent a uniformity has been esteemed by all governments a thing to be encouraged and enforced, the means hitherto adopted for the purpose seem to have proved only in part adequate to overcome the force of habit, and the strong interest of many to keep up a system of uncertainty and deception.

The next step in the progress of improvement would be the

constructing of Standard Weights and Measures of wood or iron ; and, at an early period, both in England and Scotland, standards of that kind were made, and laws were passed in both kingdoms prohibiting the use of any weights or measures differing from these. There was still, however, wanting some determinate object with which to compare these standards, to restore them if destroyed, and transmit them unimpaired to posterity. The distance of two mountains accurately measured and recorded, or the length of a pendulum vibrating seconds in a given latitude, early occurred as being the most suitable which could be devised for that purpose. From either of these the standard measure of length might, at any time, be restored, and made to serve as a foundation for all the other weights and measures of the kingdom. Thus, were a fixed scale or standard measure of length once determined, it would be easy to construct a vessel of any convenient form, the contents of which might be determined from that scale with the most perfect accuracy, and equally easy to ascertain the precise weight of distilled water of a given temperature, which, under a certain atmospheric pressure, that vessel contained.

During the fervour of the French Revolution, when a regeneration of every existing usage became a matter of political expediency, the weights and measures of that country experienced the same fate with its other existing institutions, and a mode of restoring them in perpetuity was adopted somewhat more splendid in its pretensions, than either of those to which we have before referred.

The Savans of France had been engaged in measuring the quadrant of the terrestrial meridian extending from the Pole to the Equator in the longitude of Paris, and the ten millionth part of that arc, called a "*mètre*," was, in 1795, adopted in the kingdom as the unit or standard of lineal measure, from which the following weights and measures of capacity were derived.

The *Are*, or unit of superficial measure, being a square, of which the side is equal to ten *mètres*.

The *Gramme*, or unit of weight ; this, again, is the weight of a cube of distilled water, having its side equal to the hundredth part of a *mètre*.

The *Litre* being the unit of volume or capacity. This is a cube, having for its side the tenth part of a *mètre*. The cube of the *mètre*, called a *Stère*, was used also as a measure for firewood.

All the other weights and measures of the kingdom were derived by multiplying, or dividing these continually by 10. Thus, the weights and measures of the next lower denomination contain each a tenth part of the units here mentioned, and are named *décimètre*, *déciare*, *décigramme*, and *déclitre*. After which come those containing the hundredth part only of the original units, named *centimètre*, *centiare*, *centigramme*, and *centilitre*. The weights and measures next greater than the original units, again, contain each ten of them, and are named *décamètre*, *décare*, *décagramme*, and *décalitre*, and so on. The way in which all of these are derived from the *mètre* will be easily followed, and the nomenclature, with the opinion which men of science in France entertain of the invention, will be best illustrated by the following remarks taken from a modern French author of considerable celebrity. “*Tel est le système des poids et mesures ; la nomenclature est renfermée dans cinq mots MÈTRE, ARE, GRAMME, LITRE, STÈRE ; et leurs multiples désignés par les additifs déca, dix ; hecto, cent ; kilo, mille ; myria, dix mille ; puis les sous-multiples qu'on indique par déci, dix ; centi, cent ; milli, mille.*”

“*L'idée simple et grande qui a donné naissance à ce système, repose sur la nécessité de prendre dans la nature un terme fixe et à en déduire toutes les mesures : par là, si quelque jour elles étoient perdues, il seroit facile de les retrouver.*”

“*L'esprit philosophique qui a présidé à cette belle conception, est digne de notre siècle ; les hommes les plus célèbres y ont contribué ; on y reconnoît le génie des Laplace, Lagrange, Monge, Delambre, Legendre, Méchain, Lefebvre-Gineau, etc. —L'ignorance et la mauvaise foi peuvent seules refuser d'admettre cette admirable invention *.*”

The old weights and measures of France were different and differently divided from those here mentioned, and the consequences

* TRANSLATION.—Such, then, is the system of Weights and Measures ; the nomenclature is confined to five words, *Mètre, Are, Gramme, Litre*, and

which have attended the new system may suggest many useful and instructive considerations, to those who would rashly overturn, or refine upon, the habits and usages of a people beyond what their occasions require. In short, after a trial of seventeen years, it was found necessary, in 1812, to restore to them again the old weights and measures, to which they had been accustomed, after making upon them certain modifications to connect them with the *mètre* and other units already mentioned. The *decimal* division of the new system was also abandoned, and the *duodecimal* one adopted upon the express ground, "That the decimal division, though favourable for calculations, is not equally so for the daily operations of the people, and is not easily comprehended." The effects of these successive changes has been to throw the transactions of the country into the greatest confusion, and a recent English writer upon this subject has observed, "That the French, after all their labours to recommend a uniform system of measures, have ended in such a complication, that for the most simple purposes of practical mechanics and civil life, it is become usual to carry in the pocket a little ruler, in the form of a triangular prism, one of the sides containing the old established lines and inches of the royal foot, a second the millimetres, centimetres, and decimetres of the revolutionary school, and the third the new combination of the Jacobin measures with the old division."

There is certainly something sufficiently *recherché* in the new French system, but, upon the whole, the conception seems to partake more of the *magnifique* than of the truly practical and useful,—for it is almost vain to suppose that a series of observations so

Sère. The multiples of these are expressed by prefixing to them the words *deca* ten, *hecto* a hundred, *kilo* a thousand, *myria* ten thousand; and their sub-multiples, by prefixing *déci* a tenth, *centi* a hundredth, *milli* a thousandth.

The grand and simple idea in which the system has originated, is founded upon the necessity of selecting a standard in nature, and deriving all measures from it, so that should they ever happen to be lost, it may be easy to restore them.

The philosophic spirit which has led to this beautiful conception is worthy of our age. The most celebrated men have contributed towards it, and throughout, we may recognise the genius of Laplace, Lagrange, Monge, Delambre, Legendre, Méchain, Lefebvre-Gineau, &c. Ignorance and bad faith can alone refuse to admit this admirable invention.

expensive and intricate should ever again be undertaken for the purpose merely of restoring or adjusting a measure of length. The length of the pendulum vibrating seconds, which has since been adopted in Denmark, and still more recently in Britain, appears, upon the whole, to afford a much more practical and useful standard of reference.

It has been already observed, that standard weights and measures had been prepared, at an early period, both in England and Scotland, by which all the other weights and measures of the two kingdoms ought to have been regulated. In England, the standards were deposited in the Exchequer, and duplicates made from these were kept at Guildhall and other public offices. In Scotland they were committed to the custody of some of the principal boroughs, the *Elwand* was kept at Edinburgh, the *Firlot* at Linlithgow, the *Pint* at Stirling, and the *Stoneweight* at Lanark. By the treaty of Union it was subsequently provided, that the same weights and measures should be used throughout Great Britain as were at that time established in England; but this provision seems to have been only partially carried into effect. The standards formerly existing, therefore, continued to be referred to, and, notwithstanding the laws made in both kingdoms against the use of any weights or measures differing from these, a variety of others existed. In England, before the passing of the recent act, 1824, the chain used for measuring land, and consequently the acre, differed in some counties; and besides the Troy and Avoirdupois pounds, various others had come into use, and numerous local varieties likewise prevailed in the measures of capacity. In Scotland the same kind of differences existed to a great extent, and it is only very lately that the size of the standard weights and measures of that kingdom have been accurately ascertained. Chains of different lengths, but none of them precisely equal, as they ought to have been, to 24 standard ells, were in use, giving acres of different sizes. The boll used for wheat, rye, pease and beans, was different from that used for oats, barley and malt, and the size of these bolls varied almost in every county, and even in some towns of the same county. Nearly the same kind of differences exist in the measures for liquids; and the reader will be fami-

lar with the variety of weights which, under the names of English Troy, Avoirdupois, Scotch Troy or Dutch, and Tron weight, were currently in use throughout the kingdom.

Such numerous and useless diversities gave rise, as might have been expected, to great confusion, and to numerous frauds in commercial dealings; and the necessity of establishing some uniformity was brought at different times under the consideration of the Legislature, without, however, leading to any result; till at length, upon a revival of the measure in 1818, Commissioners were appointed to consider of some remedy for the evils of the system then existing; and the act 1824 was passed in conformity with their reports.

As a first step towards any improvement, it was indispensable to abolish entirely all local distinctions in weights and measures, and to establish one uniform set of standards for the whole empire. This, it appeared to the Commissioners, required to be done with great caution, and by making as little alteration as possible upon the weights and measures in general use. With that view, it became necessary for them to select, from among the former weights and measures, those which were most generally employed, and of most convenience in practice, and where an alteration became unavoidable, to adapt it as nearly as possible to the medium of the prevailing standards. Proceeding on these principles accordingly, they reported:

1. That there did not appear to be any sufficient reason for altering the English lineal measures, which are at present generally employed.

2. That the subdivisions of weights and measures now in use appear to be more convenient for practical purposes than the decimal division; as it is of advantage to be enabled to express a third, a fourth, and a sixth, of a foot, in inches without a fraction;—and, for the operations of weighing and of measuring capacities, the continued division by two, renders it practicable to make up any given quantity with the smallest possible number of standard weights or measures.

3. That the most authentic standards of English lineal measure had been found to vary so very little from each other, that it would not make any sensible difference in common cases,

which of them was preferred. The Commissioners, however, gave the preference to the Parliamentary Standard-yard, made by Mr Bird in 1760, and they further proposed that it should be declared, for the purpose of identifying or recovering the length of this standard, in case it should ever be lost or impaired, that the length of a pendulum vibrating seconds of mean time in London, on the level of the sea, and in a vacuum, is 39.13929 inches; and the length of the French *mètre* 39.37079 inches; the English standard being employed at 62° of Fahrenheit.

4. That a cubic inch of distilled water at the temperature of 62°, weighs in a vacuum 252.458 grains, of which 5760 make a pound Troy, and 7000 a pound Avoirdupois.

5. The standard measures of capacity were found to be considerably at variance with each other, and upon a careful examination of them, the Commissioners suggested that it would be of advantage to make the gallon, both for dry and liquid measure, contain exactly 10 pounds weight of distilled water, at the temperature of 62°, which in bulk would be equal to 277.274 cubic inches.

The alterations suggested in these reports are, perhaps, under all circumstances, the most judicious that could have been devised, and afford a sufficient foundation for a very important improvement, with the least change in existing habits and usages. It remained only to carry the alterations into effect; and we come now to give a short abstract of the statute passed for that purpose, and to consider how far its provisions have already accomplished, or are likely to accomplish, the end for which they were intended.

In conformity with the Reports of the Commissioners, it was enacted by the statute 5th George IV. cap. 74,

§ 1. That from and after 1st May 1825 (afterwards extended to 1st January 1826), the yard described in the reports of the Commissioners shall be the unit and only standard measure of of extension, from which all other measures of extension, lineal, superficial, or solid, shall be derived. That 1-3d of the standard yard shall be a foot, 1-12th of the foot an inch, and that

the pole or perch shall contain $5\frac{1}{2}$, the furlong 220, and the mile 1760 standard yards.

§ 2. That all superficial measure shall be computed from the standard yard ; that the rood of land shall contain 1210, and the acre 4840, square yards, being equal to 160 square perches, poles, or rods.

§ 3. Provides for restoring the standard yard, should it ever be lost, by referring to the length of the pendulum given in the report of the Commissioners.

§ 4. Enacts, That the standard brass weight of 1 pound Troy, made in the year 1758, and now in the custody of the Clerk of the House of Commons, shall be the unit or only standard of weight, from which all other weights shall be derived: That $\frac{1}{12}$ th of the pound Troy shall be an ounce, $\frac{1}{20}$ th of an ounce Troy a pennyweight, and $\frac{1}{24}$ th of a pennyweight a grain ; so that 5760 grains shall be a pound Troy. Further, that 7000 such grains shall be a pound Avoirdupois, $\frac{1}{16}$ th of the pound an ounce Avoirdupois, and $\frac{1}{16}$ th of the ounce a dram.

§ 5. Provides for restoring the standard pound Troy from the weight of a cubic inch of water, as given in the report of the Commissioners.

§ 6. Enacts, That the gallon, containing 10 lb. Avoirdupois weight of distilled water, shall be the unit or only standard measure of capacity, from which all other measures of capacity, as well for wine, beer, ale, spirits, and all sorts of liquids, as for dry goods not measured by heaped measure, shall be derived: That $\frac{1}{4}$ th of this gallon shall be a quart, and half a quart a pint ; further, that 2 gallons shall be a peck, 8 gallons a bushel, and 8 bushels a quarter of corn, or other dry goods not measured by heaped measure.

§ 7, 8, & 9. Contain certain provisions in regard to heaped measure, which it seems unnecessary to repeat, since it appears, from a report of the Lord Mayor and Aldermen of London, that they have been found ineffective in practice.

§ 10. Contains certain provisions which relate exclusively to Ireland.

§ 11. Enacts, That copies and models of the standard weights and measures before mentioned, and of their parts and mul-

tuples, shall, within three months after the passing of the Act, be made and verified, under the direction of the Lord High Treasurer or Commissioners of the Treasury, and deposited in the Office of the Chamberlains of the Exchequer at Westminster; and that verified copies of these shall be sent to the Lord-Mayor of London, and to the Chief Magistrate of Edinburgh and of Dublin, and to such other places and persons as the Lord High Treasurer, or Commissioners of the Treasury, may from time to time direct.

§ 12. Enacts, That the Justices of the Peace in every county, and the Magistrates in every city, town, or royal burgh, shall, within six months after the passing of the act, purchase, for their respective counties, cities, &c. a model of each of the standards of length, weight, and measure, and of their parts and multiples, which, after being compared with the models in the Exchequer, shall be placed by them for inspection in the custody of such persons as they may appoint, to be produced, upon reasonable notice, at such time and place, within their respective counties, cities, &c. as any person shall in writing require, the person requiring such production paying the reasonable charges of the same.

§ 13. Provides for the expense of procuring and transmitting the models.

§ 14. Points out the means of obtaining a standard gallon, in cases where recourse cannot be conveniently had to the verified models.

§ 15. Enacts, That, after the passing of the act, the weights and measures referred to in all contracts, bargains, sales and dealings, shall be held to be the weights and measures established by the act, unless there be a special agreement to the contrary; and, where a special agreement is made, having reference to local weights or measures, it is enacted, that the proportions which these bear to the weights and measures in the act, shall be expressed in the agreement, otherwise it shall be null and void.

§ 16. Declares and enacts, That it shall be lawful for any person to buy or sell goods and merchandise by local weights or measures, provided that the proportion which these bear to the weights or measures in the act be painted or marked upon

them. But that nothing contained in the act shall be understood as permitting any person, after 1st January 1826, to *make* weights or measures, which are not in conformity with the established standards.

§ 17. Provides for the conversion of payments in grain, &c. and is confined exclusively to England and Ireland.

§ 18. Provides for ascertaining the amount of stipends, feu-duties, rents, tolls, customs, &c. payable throughout Scotland in grain, malt, meal, &c. having reference to the weights or measures heretofore in use. For which purpose it is enacted, That an inquisition be taken before the Sheriff-depute or Substitute in each shire, as soon as conveniently may be, after the expiration of six months from the passing of the act, and sent to the Exchequer at Edinburgh; and the amount to be ascertained upon these inquisitions, it is declared, shall, when converted into the weights and measures established by the act, be the rule of payment for all such stipends, feu-duties, rents, tolls, &c. in time coming.

§ 19. Enacts, That after such inquisitions shall have been made, accurate tables of conversions shall be prepared and published, under the authority of the Commissioners of the Treasury, for the regulation of all future payments.

§ 20. Directs tables to be constructed for the collection of the customs and excise, &c.

§ 21. Enacts, That the regulations and penalties of the British Acts 29th Geo. II. c. 25; 31st Geo. II. c. 17; 35th Geo. III. c. 102; and 55th Geo. III. c. 43, for the ascertaining, examining, seizing, breaking, and destroying any weights, balances, or measures, not conformable to the standards, shall be applied to this act.

§ 22. Enacts, That the like regulations and penalties of the Irish Acts, 4th Anne (1.); 2d Geo. II. (1.); 25th Geo. II. (1.); 27th Geo. III. (1.); 28th Geo. III. (1.), shall be applied to this act.

§ 23. Repeals the parts of former statutes, which relate to the establishing of weights and measures.

The remaining sections of the act relate to the reservation of certain privileges enjoyed by the cities of London and Westminster, and need not be here repeated.

The denominations of weights and measures given in this abstract are few in number ; they, however, constitute the whole of those which, under the name of *imperial* weights and measures, are now established throughout the kingdom. All others referring to standards different from those in the act are abolished ; and, since 1st January 1826, no person has been permitted to make them ; nor has it been lawful for any one to use the weights or measures of that description, which may have been before in his possession, without having the proportion which they bear to the established standards painted or marked upon them.

It will be observed that, in so far as regards lineal measures, the act makes no alteration in those which formerly existed in England. In Scotland it merely abolishes the ell of 37 inches and a fraction, which, however, in most parts of the country, had fallen almost entirely into disuse ; but it does not alter the inch, the foot, and the mile, all of which were English measures.

In superficial measure, the act makes no change in England, further than to abolish any local varieties of land measure that may have existed. It makes, however, a very important change in the land measure of Scotland, abolishing entirely the Scotch acre, which ought to have been raised from a square of 24 standard ells, the length of the Scotch chain, but which, in practice, varied a little from this, and has not been uniform. The imperial acre, raised from a square of 22 yards, the length of the English chain, has been now substituted in the place of the uncertain measure here mentioned. The Scotch acre, along with the other weights and measures of that kingdom, was abolished by the Articles of Union ; but, excepting in the counties bordering on England, measures nearly approaching to it had continued generally in use. Experienced judges have suggested the convenience of introducing a standard chain of 100 feet as the basis of the acre ; but it seems to be sufficient, that, with due regard to existing laws and usages, the act has established the extent of the acre, leaving practical men to ascertain the contents of land expressed in that acre, and its parts, by any chain or mode of measurement which may be found most eligible.

It might have been desirable to have had one system of weights only established throughout the kingdom, and the preference would naturally have been given to the Avoirdupois, as being that in most general use. Many circumstances, however, appeared to favour the keeping up of Troy weight. For one thing, the coinage has been uniformly regulated by it; and as medical prescriptions and formulæ have been all along prepared and published under a peculiar subdivision of that weight, it might have led to considerable inconvenience to discontinue it. The act makes no alteration in the weights throughout England, further than to do away the local variety of the pound before referred to. In Scotland it makes a much greater change, abolishing the Scotch Troy or Dutch weight, of which the pound contained about $17\frac{1}{2}$ ounces, and also the old Tron weight, of which the pound varied from 21 to 28 ounces, and which still continued in use for some commodities, though specially prohibited by the Scotch Parliament in 1618. Both the pounds here mentioned have been now reduced to that of 16 ounces Avoirdupois. The act does not recognize any weight superior to the pound, and it may be considered a defect, and lead to uncertainty, that it has not established the Avoirdupois stone, quarter, hundredweight and ton, all of which are in such general and constant use.

An important change is made by the act in the measures of capacity, both in England and Scotland. In England, besides doing away with the local measures, it changes the size of the gallon in wine or spirit measure from 231 to the imperial gallon of 277.274 cubic inches. It changes also the ale and beer measure, but in a very slight degree, reducing the ale gallon of 282 cubic inches to the imperial gallon. In dry measure, the act establishes the peck, the bushel, and the quarter, as the only multiples of the imperial gallon; and in this way the imperial bushel comes to contain about 2218 cubic inches, while the Winchester bushel contained only 2150.42. In liquid measure, the act does not recognize the firken, barrel, tierce, hogshead, puncheon, butt or tun; nor in dry measure the coom, load and last, though it might have been well had such of these as were found most convenient in practice, and which are indispensable in trade, been established, and their capacity defined. It may here also

be remarked, that neither in this, nor in any other act, is there any regulation made with regard to the capacity of the most common of all liquid measures—the bottle, though it is quite understood in trade that there is none in which greater deception is frequently practised. In Scotland, the act makes the same alteration on the wine and spirit measure that it does in England: it abolishes, besides, the Scotch liquid measure, and the whole of those measures which, under the names of Lippy, Cap, Firiot and Boll, prevailed in such endless and complex varieties throughout the different counties of Scotland, substituting in the place of all these the imperial gallon, quart and pint, for liquids, and the imperial quarter, bushel and peck, for all kinds of grain and meal. It appears, from the Scotch statute 1618, to have been of old the custom to measure wheat and barley by the same firiot, the one straked, the other heaped; and it was in order to keep up the distinction, and do away heaped measure, that the one was by that statute made larger than the other.

After what has been already remarked, it seems almost unnecessary to say more in regard to the heaped measures established by the recent act. Considering the careful and scientific foundation laid by the Commissioners, it was scarcely to have been expected that the custom of any particular city or district would have led to the keeping up of a description of measures so indeterminate and seemingly so unnecessary; as all commodities sold by it, it is presumed, might with equal facility, and far less chance of fraud, be sold by weight.

The imperial weights and measures were brought into general use in Edinburgh at the time specified in the act; and when the difficulty experienced for a few weeks at first had worn off, the introduction of them was felt by all classes of the community to be a very great and beneficial improvement. They have likewise been forced into use in some other parts of the kingdom, by the officers of the Customs and Excise, for those commodities which fall under their cognizance. But, for other commodities, and in most of the counties, the same kind of energy has not been exerted, and the ancient weights and measures continue over the greater part of Scotland to be those practically employed. In sales or contracts, reduced to writing,

the proportions which these bear to the new, required to be specified ; but this, when attended to, is done out of mere formal compliance with the statute, the old measures being, in such a case, those which are really acted upon and referred to. In verbal transactions, throughout most parts of the kingdom, matters remain nearly in the same state as before the passing of the act, except that, by the partial employment of a new description of measures, in some counties, increased confusion and means of deception have been introduced.

These new measures are formed by giving old names to certain multiples of those established in the act, distinguishing the new creation by the name of *Imperial Measures*. Thus we already have a variety of what is called the *Imperial Wheat Boll*, containing each some integral number of imperial bushels, which come in the place of the old firlots. We have also measures different from these, which are named the *Imperial Barley and Oat Boll* ; and if we have not already, we may soon expect, *imperial stones*, of every grade, from 14 to 28 lb., and other *imperial weights and measures* of the same description, which it seems to be understood that the act permits any one to form according to his own fancy, and to the kind of measure with which he has been most conversant.

Some counties, which, at first, adopted the new measure for grain, and returned the market prices according to it, have since considered it necessary to abandon it, their transactions not having been understood in neighbouring counties, where the old system was adhered to ; and now, in the greater number of quotations and returns of market prices, the old measures are retained and published, though it is plain that, by this means, one important purpose of the act is defeated. The Society of Scottish Land-Surveyors, we also understand, came early to the resolution of reporting their measurements only according to imperial measure ; but, in cases of sale, it appeared to their employers that it might be more likely to attract purchasers, were the contents to be also expressed in Scotch acres. Accordingly it has now become the custom to give both ; and the surveyors complain that, owing to the toleration given in the act, their trouble in calculation has been doubled.

The consequences here complained of appear to have resulted

from the act not having recognized some of those weights and measures which are found to be indispensable for the purposes of trade; and, in a still greater degree, from the liberty given to use the old weights and measures, by merely having the proportion which they bear to the new marked or painted upon them. It might almost have been foreseen that a liberty of this kind would be received as an invitation to abuse, and that it would at once be laid hold of as a means to undermine, and ultimately to defeat, the other provisions of the act. It is to be regretted that the trifling charge on traders of procuring new weights and measures, should have been allowed to weigh against the serious evil which such a liberty is calculated to keep alive.

The effect of having the variety of measures before noticed, the old, the new, and the combination of both, is to produce the greatest confusion, and to give rise to mistakes and frauds in a far greater degree than if the old system, with all its imperfections, had been let alone. It may be inferred, however, from the example set by Edinburgh, and other places where the new measures have been introduced, that, with the exertion of a little energy, the use of them might have been made general, with the most beneficial effects; and it seems to be due to those cities and counties which have even partially conformed to the new system, that as little farther change as possible should be hereafter made upon it, and that it should be enforced throughout the other cities and districts of the kingdom with the utmost strictness.

Inquests have now been held throughout all the counties of Scotland, and their verdicts have been returned to the Exchequer, and have since been published with copious and accurate tables *, for converting the local weights and measures into imperial. These seem to afford all the information and evidence necessary in business; and it may require consideration, in how far they might be held to supersede the necessity of the tables referred to in the 19th section of the act; for it may be observed, that a government publication of the local varieties of

* The Tables here referred to are those published in 1829 by Mr George Buchanan, civil engineer, which present, in the most clear and distinct forms, all the information which can be desired in regard to local weights and measures, and the conversion of prices.

weights and measures, might have a tendency to give them an importance and a name, of which they seem to be utterly unworthy,—a great part of them, particularly in the measures of corn, having arisen, as appears from the verdicts, entirely from the ignorance and unskilfulness of the workmen employed in their construction. The sooner varieties of that kind are consigned to oblivion, or to the shelves of the antiquary, so much the better; and, were they once out of use, experience has shown, that, in the adjustment of prices, the community, with the information they at present possess, will be sufficiently alive to the differences existing between them and the new measures.

It appears that it would have been of advantage had the act contained within itself a complete system of regulations, calculated to enforce the new weights and measures. At present, however, the course of procedure for the conviction of offenders is not distinctly laid down, nor does the act declare the penalties to which they shall be subjected, but refers to various preceding Acts of Parliament, with which it is difficult for country magistrates to be in all instances familiar. In questions affecting the dealings of the people, and which are likely to be of such constant occurrence in practice, it certainly would have been better had the powers of the magistrates been exactly defined, the mode of conviction rendered simple, and the punishments distinctly specified.

The act, it may be said, has by this time run its course, and, in most places throughout Scotland, has now sunk into disregard. It must be admitted that its provisions have proved insufficient to counteract the force of habit, and the strong interest of many to keep alive a system of uncertainty and deception. There can be no question, however, that the general introduction of uniform measures would be a great benefit to the community, and that a little energy at first is all that is wanted to have its utility recognised. The public have a right to expect that the act shall not be allowed to fall into disuse, but that the necessary means shall be taken to enforce it; and, we repeat, that it is due to those cities and counties which have adopted the new system, that its introduction should be made general throughout the kingdom.

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points in which the act appears to be defective or insufficient, and these we may shortly recapitulate. From the best information, therefore, which we have been able to procure, it appears,

1. That those weights and measures, which are found to be indispensable for the purposes of trade, and the places of which are not supplied by those in the act, should be recognised and defined. The weights and measures of that description must be in frequent use, and it is proper, therefore, that their precise dimensions should be fixed and known to the public. It does not appear that it would be likely to injure the new system, were a table of them presented as an appendix to the act.

2. That the liberty, under any circumstances, to use the old weights or measures should be withdrawn; and it might be proper to have it declared that the use of them hereafter, like that of false weights or balances, should be held to be illegal, and be punished by a fine, the *maximum* and *minimum* amount of which should be fixed by the act.

3. That the act, being intended for the guidance of all classes of the community, should form a complete code, without reference to other statutes; and, in particular, that it should prescribe a cheap and easy course of procedure, with forms annexed, at the suit of any party, for the punishment of offenders.

It occurs to us that we cannot close the present article better than by annexing tables of the whole imperial weights and measures which are at present recognised, with the exception of heaped measure; and, although the new French system has undergone some modification, it has been thought desirable also to exhibit the values of the units to which we have before referred, expressed in imperial measure.

IMPERIAL WEIGHTS AND MEASURES.

1. LINEAL MEASURE.

Inches.		Feet.		Yards.		Poles		Furlongs.		Miles.
12	=	1								
36	=	3	=	1						
192	=	16½	=	5½	=	1				
7920	=	660	=	220	=	40	=	1		
63360	=	5280	=	1760	=	320	=	8	=	1

2. SUPERFICIAL MEASURE.

Inches.		Feet.		Yards.						
144	=	1								
1296	=	9	=	1		Poles.				
39204	=	272½	=	30½	=	1		Roods.		
1568160	=	10890	=	1210	=	40	=	1		Acre.
6272640	=	43560	=	4840	=	160	=	4	=	1

3. TROY WEIGHT.

Grains.		Pennyweights.		Ounces.						
24	=	1								
480	=	20	=	1				Pound.		
5760	=	240	=	12	=			1		

4. AVOIRDUPOIS WEIGHT.

Grains Troy.		Drams.		Ounces.						
27·34375	=	1								
437·5	=	16	=	1				Pound.		
7000.	=	256	=	16	=			1		

5. LIQUID AND DRY MEASURE.

Cubic Inches.		Pints.		Quarts.						
34·659	=	1								
69·318	=	2	=	1		Gallons.				
277·274	=	8	=	4	=	1		Pecks.		
554·548	=	16	=	8	=	2	=	1		Bushels.
2218·191	=	64	=	32	=	8	=	4	=	1 Quarter.
17745·526	=	512	=	256	=	64	=	32	=	8 = 1

FRENCH STANDARDS,

Expressed in Imperial Measure.

The Mètre	=	39·37079	Imperial Inches.
Are	=	3·954	Imperial Perches.
Gramme	=	15·4068	Imperial Grains.
Litre	=	61·0271	Imperial Cubic Inches.
Stère	=	35·3166	Imperial Cubic Feet.

A. G.

January 1830.

ON THE MALT AND BEER DUTIES.

THE deep interest which the agitation of this question has now excited, and the manner in which it is supposed to affect that great Interest to which our humble services are especially devoted, impose it upon us as a duty, to avail ourselves of the earliest opportunity presented, to explain the opinions which we entertain upon the subject. The question, under the circumstances in which the country is placed, acquires a peculiar degree of importance. After years of profound peace, we find ourselves, contrary to all the conclusions which analogy would lead us to form, in a state of greater embarrassment and difficulty than was ever experienced during the long continuance of an arduous and expensive war. We seem to have all the materials of prosperity within our reach, and yet the distribution of these materials is such, that the capitalist is borne down by an unforeseen pressure, and the great mass of the population retained in a state little short of destitution. In circumstances so anomalous, the anxious inquiries of men are naturally directed to the means of remedy ; but it unfortunately happens, that, in proportion as the suffering experienced is great, the judgment is apt to be biassed, and the passions excited ; and those who suffer are more apt to grasp at the first seeming remedies that are presented, than to consider their fitness or sufficiency. In such a state of things, it well behoves those who can influence, in any degree, the public opinion, to exercise caution, lest they heedlessly promote delusion and error, and aggravate or prolong the distresses complained of, by proposing means for their removal which are inefficient or inapplicable.

These general remarks we make with reference to the particular question to which we now propose to direct the attention of our agricultural readers. We must fairly apprize them, before entering upon the question at all, that, after the most anxious consideration which we have been able to bestow upon it, we have been led to distrust many of the conclusions which ingenious men have drawn, and conceive that we see reason for questioning whether any modification of the malt and beer duties, practicable in the existing state of the finances of the

country, be a means calculated to lighten, in a material degree, the burden under which the landed interest of this country now labours. In explaining the grounds upon which this opinion is founded, we feel that we must enter into a variety of details, irksome, perhaps, in the perusal, but necessary to elucidate the subject, and lead us to a correct and sober judgment of the question at issue.

The duties under consideration have been the subject of frequent and eager discussion in this country, from their having been long resorted to by Government, as an easy and efficient means of raising a revenue. The malt-tax was originally established in England during the troubles in the reign of Charles I., but it did not become of any considerable importance till the year 1697, when the duty was at the rate of 6d. per bushel. This duty constituted what was called the old annual malt-tax. The first permanent duty was imposed in 1760, at the rate of 8d. per bushel; a further tax was granted in 1779, and an additional permanent duty of 6½d. 2-10ths. per bushel was imposed in 1780. These permanent duties were consolidated in the year 1787, and one permanent tax to the amount of 9½d. per bushel was then imposed. But the nature of this tax was changed when the plan for redeeming the land-tax was adopted, it having been, after that time, granted as a substitute for the annual land-tax. In the year 1802 an addition was made to the former duties, to the amount of 1s. 0½d. per bushel, which was of a permanent nature; and, in 1803 a further tax, at the rate of 2s. per bushel, called the war-duty, was imposed, to continue during the war and six months after its conclusion. In 1816 the war-duty was discontinued, and the whole duties then upon malt became again at the rate at which they had previously been. In 1820 the duty was raised for that year and the following one, and in 1822 it was reduced to 20s. per quarter. In consequence of some oversight in the framing of an act in the year 1826, it was collected, during a part of that year, at 21s. 4d. per quarter; but this was rectified, and the act of the 7th and 8th Geo. IV. c. 52, commonly called the Act for Consolidating the various Duties payable on Malt, is that by which the duty of 20s. 8d. per quarter is levied on all malt made from barley in the United Kingdom of Great Britain and Ireland.

The history of the malt-tax, as regards Scotland, is somewhat different. It would appear, that, so far back as the Union, Scotland made a struggle to be exempted from the tax, as being inconsistent with her means and the state of the country. In 1713, the annual malt-tax was extended to Scotland, but it was shortly afterwards reduced to one-half; and until 1802, the duty chargeable on malt in Scotland was only one-half of the rate imposed in England. The taxes granted in 1802-3 were, however, extended over the two countries, with the exception of 8d. per bushel on bigg, which was deducted from the last duty. The duties in the two countries have since that time continued to be the same, with this exception of malt made from bigg, which has at various times been altered, and is now 16s. per quarter.

Malt may be said to yield a revenue to the country only in so far as it is made for the brewing of beer, because the duty on that which is made into spirits, independently of the quantity being small, may be considered as nearly all returned to the distillers in the form of a drawback. When the beer is brewed by public brewers, it is chargeable with a duty varying from 9s. to 9s. 10d. per barrel on strong beer, 4s. 11d. per barrel on intermediate beer*, and 1s. 9½d. to 1s. 11½d. per barrel on table beer; but when brewed by private individuals for their own use, no beer-duty is chargeable. The malt and beer duties, then, taken together, may be regarded as a tax on the beer consumed by the community, who thus pay both a malt-tax and beer-duty when the beer is made by brewers, and a malt-duty only when brewed by private individuals.

To enable our readers to form a proper idea of the extent and importance of the malt and beer duties, and of the annual revenue which arises from them to the country, we have prepared the following statement, which is made up on an average of the five years preceeding the 5th January 1828. In this as well as in other similar details which are given in this paper, we have adhered as much as possible to round numbers, and we have avoided all minor and immaterial corrections, which might

* This is a description of beer made by the retail brewers in England, and the consumption of it is very inconsiderable, as will afterwards be more fully seen.

tend to perplex the reader, without at all affecting the general results. The whole of these details are taken from official documents laid before Parliament principally in session 1828, and to these we refer generally for a corroboration of any statements of the kind which we may give.

The average Annual quantity of Malt made, and Duty paid thereon, during the period referred to was, in

	Quarters.	Duty.
England, . . .	3,426,256	L. 3,480,992
Scotland, . . .	341,806	334,187
Together,	3,768,062	3,815,179

Of this quantity of Malt there was made into Beer by licensed Brewers and Victuallers, who paid Beer-duty, in

England,	Qrs. 2,673,147
Scotland,	78,690
	<u>2,751,837</u>

Leaving the quantity of Malt which paid no Beer-duty, and which was apparently applicable to the manufacture of home-brewed Beer and Spirits, } 1,016,225

The quantity of Malt made into Spirits, and the amount of drawback paid to distillers thereon, was

367,853	<u>238,789</u>
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And there thus remains the quantity of Malt which was apparently applicable to the manufacture of home-brewed Beer, and the whole amount of Revenue arising from the Malt-tax, } Q. 648,372 L. 3,576,390

The Revenue arising from the Malt-tax and Beer-duty taken together, then, may be stated as follows:—

1. Duty on Malt made into Beer by Brewers, being 2,751,837 quarters, at the rate chargeable thereon, is L. 2,843,564

And the Beer-duty, taken for the average of the five years, was, in

England,	L. 3,280,030
Scotland,	81,386
	<u>3,361,416</u>

Revenue from Beer made by Brewers, 6,204,980

2. Duty on Malt which pays no Beer-duty, being 648,372 qrs. 669,984

Whole revenue from Beer, 6,874,964

3. Duty on Malt made into Spirits, 62,842

Whole Annual Revenue from the Malt-Tax and Beer-duty, L. 6,937,806

When it is thus seen that these duties yield an annual revenue to the country of nearly L. 7,000,000 Sterling, it will at once be obvious, that any proposed alteration of the laws affecting them must have a reference to revenue. Such a sacrifice as a total repeal of the duties, we conceive to be nearly impracticable; and we cannot help expressing our surprise, that well informed men, with a knowledge of the state of the country, and its finances, should be found to propose to Government a measure which must at once be accompanied with a demand, either that the national creditor shall be defrauded, or that a reduction shall take place in the expenditure of the country, corresponding to the loss of revenue which would be occasioned. Now, with every disposition to advocate the diminution of all unnecessary public expenditure, we cannot conceive by what means this is to be accomplished, to the extent necessary to compensate so great a sacrifice as would be occasioned by the repeal of these duties. Malt liquor has hitherto been regarded in this country, as a legitimate subject of taxation, and has long been one of the great national sources from which a revenue has been drawn; and, in this respect, it is in a similar situation with other necessary articles of consumption which pay excise-duty. A tax on all such commodities is assuredly an evil; but we must remember, that by such means only can a revenue be raised, and that were we to strike off such taxes, our revenue would be reduced to almost nothing. Taxes on the luxuries of the rich, although better, inasmuch as they are paid by those who are best able to pay taxes, have rarely been found very efficient as sources of revenue. By over-taxing the wealthy, we may often inflict a far more serious evil on the country, than by a moderate tax more generally extended, because by such means, absenteeism, with all its evils is produced, and capital is driven to other countries. While every man, therefore, must deplore taxation of the necessities of life, it must be submitted to as a necessary evil, so long as a revenue must be maintained.

A tax on any commodity may be said to be oppressive, in proportion as that tax forms a greater or less part of the price of the commodity paid by the consumer. Thus, if a man pay 9d. per pound for any given commodity, inclusive of 3d. per

pound of tax, he pays 6d. for his commodity, and 3d. for his tax; or he may be said to pay 50 per cent. of tax on this article of his consumption. Again, if one pound weight of any given raw material cost 1s., and the tax payable upon it amount also to 1s., and if this material be afterwards manufactured into an article, which, in consequence of its enhanced value, by the labour bestowed upon it, costs the consumer 5s.; in this case he pays 4s. for the commodity, and 1s. for the tax, or he may be said to pay a tax of 25 per cent. on this article of his consumption; but it would evidently be improper to say that he paid a tax of 100 per cent. in place of 25 per cent., merely because the duty on the raw material is 100 per cent. These are clearly the principles upon which the relative taxation of commodities ought to be estimated; and the distinction ought to be particularly kept in view, when a comparison is made with the design of affording relief by a remission of any particular tax. Thus, when the leather-tax was repealed, if it had been remembered that that tax formed only a very small part of the price paid by the consumers for the leather in its manufactured state, in the shape of shoes and other articles, it never would have been contemplated that its repeal was to have afforded any material relief to the country; and this would have been the best of all reasons for the continuance of the tax. As it is, the revenue has lost about one million and a half sterling, without any benefit ever having been acknowledged or felt by the public. In the same manner when the war-tax on malt was discontinued in 1816, although it was an actual reduction of nearly 50 per cent. of the tax, yet our readers will remember that its remission was a great sacrifice to the revenue, without any corresponding benefit having been experienced by the community. In proportion, then, as a tax forms a small part of the price as paid by the consumers for the manufactured commodity, it may be said to be light, and to be consequently a proper and good tax; and when to this is added the advantage of such commodities being of general consumption, the tax becomes the most appropriate and efficient for raising a revenue. We shall accordingly endeavour to estimate how far the tax on beer may be regarded in the light of a good

and proper tax, and to see how beer is really taxed, with reference to other exciseable commodities of general consumption.

The annual quantity of beer manufactured in England and Scotland, taken for the average of the five years already mentioned, was 8,320,771 barrels, consisting of strong beer, intermediate beer, and table-beer; and, if we assume the brewers' prices of these different kinds to be 50s. 30s. and 20s. per barrel respectively, we have the following results: *

1. Beer made in England.

Strong Beer, 6,441,846 barrels, at 50s.	L. 16,104,620	0	0
Intermediate do. 10,644 barrels, at 30s.	15,966	0	0
Table do. 1,502,366 barrels, at 20s.	1,502,366	0	0
	<hr/>		
	L. 17,622,942	0	0

2. Beer made in Scotland.

Strong Beer, 119,771 barrels, at 50s.	L. 299,427		
Table Beer, 246,142 barrels, at 20s.	246,142		
	<hr/>		
	L. 545,569	0	0

Price paid annually to the brewers for beer, L. 18,168,521 0 0

And if to this we add 15 *per cent.*, in lieu of retailers' profits and charges, we have 2,726,278 0 0

Giving the price paid by the community for beer, L. 20,893,799 0 0

being at the rate of

4½d. per Quart for Strong Beer.	
2½d. " Intermediate Beer.	
1½d. " Table Beer.	

Now, the annual tax on beer made by brewers being, as already stated, L. 6,204,980, it is equal to 29½ per cent. of the whole price, as paid by the community, or, in other words, with reference to the principles which we have just stated, *beer* is taxed about 42 per cent. It is true that hops, which pay a tax, form part of the price of beer; but, supposing the whole hop-duty were taken into account, it would alter this calculation only about 1 per cent. Correctly speaking, however, 42 per cent. is the real tax upon beer, arising out of the malt and beer duties, and this in an extreme point of view. Supposing, then, that the whole malt and beer duties were repealed, the saving to

* These rates we have stated rather below the average; but this we have done, in order that the taxation on beer may be exhibited at the highest rate.

the community would be just the amount of these duties, and the effect of the measure would be to reduce the rates of beer, as stated above, to the following, viz.

3½d.	per Quart for Strong Beer.
3d.	Intermediate Beer.
1½d.	Table Beer.

being a reduction in price of 1½d. per quart on Strong Beer, ½d. on Intermediate Beer, and ½d. on Table Beer.

Could such a saving, consistently with the public interest, be effected in favour of the consumers of malt liquor, we should be among the first to desire it, notwithstanding of the circumstance that tea, sugar, coffee, and many other similar commodities, are chargeable with more than double the tax which has been shown to affect beer. But, holding, as we do, that such a sacrifice neither will be, nor can be, made by Parliament, or the executive government, we come next to consider the proposal of a repeal of the beer-duties alone.

It has been contended that a repeal of the beer-duties would not only greatly benefit the consumers of malt liquor, but would so increase the consumption, by reducing the price, as both to maintain the revenue, and be productive of great advantages to the agriculturists, by creating an increased demand for barley. Now, supposing a repeal of the duties in question to be made, the amount of that duty would be the annual saving to the consumers of beer; and they would have the amount of that saving to lay out or expend on an additional quantity of beer, or on other necessities or luxuries of life. It does not by any means follow, that it would be expended on an additional quantity of beer; nor do we believe that it would, for reasons to which we shall afterwards more fully advert; but we shall, for the sake of the argument, suppose it to be so; and we shall still have, as before,

The annual outlay by the community on beer, . . .	L. 20,893,799	0	0	
If from this we take the amount of the present beer-				
duties,	L. 3,361,416	0	0	
And 15 per cent. thereon, in place of				
retailers' charges, as before,	504,211	0	0	
		3,865,627	0	0
There remains the sum which would purchase the }				
quantity of beer at present consumed, . . . }		L. 17,028,172	0	0

And if, to manufacture the quantity of beer which is at present consumed, it requires, as we have already seen, 2,751,887 quarters of malt, it follows, that it would require 3,376,540 quarters to manufacture the quantity which L. 20,893,799 would purchase, being an excess over the quantity at present used of 624,703 quarters.

Again, the quantity of malt which it is thus supposed would be used would pay a duty of 20s. 8d. per quarter, so that we should have—

Duty on 3,376,540 qrs. malt, at 20s. 8d. . . .	L. 3,489,092	0	0
But the present malt and beer duties, together, yield			
a revenue of	6,204,980	0	0
Difference, being the decrease of revenue which would			
take place,	L. 2,715,888	0	0

And, in this view, independently of the decrease of revenue, the practical effect of the measure would be, in the first place, to reduce the price of beer nearly one penny per pot to the consumer; and, in the second place, to cause an increased demand for 624,703 quarters of malt from the agriculturists. The effect which this increased demand for malt might have in increasing the ability of the community to purchase an additional quantity of beer, involves considerations which it would be out of place here to enter upon; but, we apprehend, that, even in the most sanguine view that can be taken, it will hardly be contended that it would be such as to maintain the revenue. To maintain the revenue would require the consumption to be increased to 6,004,820 quarters, because the revenue to be maintained being L. 6,204,980, it would require this quantity, at the present rate of duty, to produce it. If, then, this quantity of malt were manufactured and sold at such rates as it could be sold at, supposing the present beer-duty repealed, we should have—

The price paid to the brewers for beer amounting to	L. 32,310,710	0	0
And if to this we add 15 per cent., as before, . . .	4,846,606	0	0

It gives the sum which must be expended annually	}	L. 37,157,316	0	0
by the community on beer, so as that the duty				
on the malt used in the manufacture of that beer				
shall produce the same revenue which the malt				
and beer duties now produce,				

being an increase over the sum at present expended of L. 16,263,517.

That such an increased consumption and demand for malt-liquor would follow a repeal of the beer-duty, we may safely pronounce to be impossible. In estimating the probability of an increased consumption of any commodity, from a reduction of the tax affecting it, several important considerations must be kept in view. The commodity itself must be such as would be calculated to be more generally used were its price reduced, either by inducing the present consumers of it to use a greater quantity, or by extending its consumption to another class of the community; and the effect of the reduction of the tax either in increasing the consumption, or affecting the revenue, will depend much on the proportion which the tax to be reduced bears to the price of the commodity as paid by the consumers. In proportion as the tax constitutes a great part of that price, an increased consumption is rendered more likely, from its requiring a small increased means of purchase from the community; and in proportion as it constitutes a small part of that price, any increase either of consumption or revenue is rendered less likely, from the great increased means of purchase which it requires *. Thus, if a man consume L. 100 worth of any given commodity, L. 80 of which is a tax, we have—

Cost of the commodity,	. . . . .	L. 20	0	0
Tax thereon,	. . . . .	80	0	0
Price which he pays for the commodity,		—————	L. 100	0 0

If the tax is reduced to L. 30, or about 62 per cent., we have—

Cost of the commodity,	. . . . .	L. 20	0	0
Tax thereon,	. . . . .	30	0	0
Price which he would pay for an equal quantity of that commodity,		—————	L. 50	0 0

But he has still L. 50 of the same fund which he formerly appropriated to the purchase of this article of his consumption—which suppose that he

Carry forward,		—————	L. 50	0 0
		—————	L. 100	0 0

* A principle too much, we conceive, hitherto overlooked by those who have treated of taxation, is, that the general consumption of the commodities of a country, must be limited by the means which the consumers possess of purchasing. This principle involves several important consequences, which, however, it would be unsuitable to the nature of our present paper for us to attempt to elucidate and trace.

Brought forward, L. 50 0 9 L. 100 0 0
is still to lay out in the same manner, and we have—

Price which he pays for an additional quantity of the commodity, . . .	L. 20 0 0
Tax thereon, . . .	30 0 0
	<hr/> L. 50 0 0

Exhausting the means of purchase, as before,	<hr/> L. 100 0 0
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So that he has now, with the same means,

Paid for the commodity, . . .	L. 40 0 0
Paid tax thereon, . . .	60 0 0
	<hr/> L. 100 0 0

Or, in other words, his consumption of the commodity has been doubled, or increased 100 per cent., and the revenue has lost only L. 20, or 25 per cent, by the reduction of the tax; and, if he would lay out L. 33 : 6 : 8, in addition to his former L. 100, or an increase of $33\frac{1}{3}$ per cent., of the means of purchase, the revenue would be maintained. Thus showing, that when a tax forms a great part of the price of a commodity, as paid by the consumer, a reduction of it is calculated to increase the consumption, without materially affecting the revenue.

On the other hand, if the commodity should cost L. 80, and the tax be L. 20, we have,

Cost of the commodity, . . .	L. 80 0 0
Tax thereon, . . .	20 0 0

Price paid for the commodity, . . .	L. 100 0 0
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And suppose the duty reduced, as formerly, in the same proportion, or to L. 7, 10s. we shall have

Cost of the commodity, . . .	L. 80 0 0
Tax thereon, . . .	7 10 0

<hr/> L. 87 10 0

And, if the remainder of the L. 100 is still to be laid out, we have,

Paid for additional quantity of the commodity, . . .	L. 11 8 7
Tax thereon, . . .	1 1 5

<hr/> 12 10 0
100 0 0

Exhausting the means of purchase, as formerly,
And giving,

Paid for the commodity, . . .	L. 91 8 7
Tax thereon, . . .	8 11 5
<hr/> 100 0 0	

Or, in other words, the consumption has increased only 14 per cent., while the revenue has been diminished 62 per cent ; and, to yield the same revenue, the sum necessary to be expended would be L. 133 : 6 : 8, in addition to the former L. 100, or an increase of $133\frac{1}{3}$ per cent. on the means of purchase : Thus showing, that, when a tax forms a small part of the price of a commodity, any reduction of it is not calculated to increase the consumption materially, but to diminish the revenue considerably.

The wine-duties and the spirit-duties have been frequently referred to as examples, where a reduction of duty has not been attended with a diminution of revenue. In reference to the first of these, we would only remark, that, previous to their reduction, they constituted one-half at least, on the average, of the price of the wine as paid by the consumers—or, in other words, that wine was taxed to the extent of 100 per cent. The duties were reduced about 40 per cent.—the consumption has certainly increased, but it is not true that the revenue has been maintained, as will be seen from the following statement.

The total quantity of all kinds of wine which paid duty for home consumption in England and Scotland during the years

1822, was Imp. Galls.	4,333,793,	and the duty thereon was	L. 1,765,354 0 0
1823,	4,594,211	“ “	1,907,529 0 0
1824,	4,714,949	“ “	1,975,281 0 0
Average quantity	<u>4,547,651</u>	Average duty,	<u>L. 1,832,721 0 0</u>

1826, was Imp. Galls.	5,510,677,	and the duty thereon was	L. 1,269,165 0 0
1827,	6,254,310	“ “	1,482,301 0 0
1828,	6,596,729	“ “	1,580,993 0 0
Average quantity,	<u>6,120,572</u>	Average duty,*	<u>L. 1,444,153 0 0</u>

Thus showing that the consumption has been increased about one-half, and the revenue decreased nearly one-fourth ; and if we assume that the duties were precisely one-half of the price paid by the community for wine previous to the reduction, and

* The year 1825 is omitted, as that was the year on which the duties were reduced, and there was, of course, a large increase of stock in the dealers' hands, which cannot be regarded as consumption.

that the reduction of duty was precisely 40 per cent., we have,

- | | |
|--|--------------------|
| 1. The annual outlay by the community on wine,
previous to the reduction of duties in 1825, | } L. 3,765,442 0 0 |
| 2. The annual outlay by the community on wine,
since the reduction of duties, | } L. 3,851,074 0 0 |

So that the real outlay on wine at this moment is little more than it was previous to the reduction of the duties; and if a correction were made on account of the lower quality of the wines now imported, we believe that this outlay would not be found to be so great as shown by the above calculation.

Now wine was, and is, in a very different situation from beer: it was an article of limited consumption among the better classes of the community, and was likely, by being reduced in price, to be used among an additional class of consumers: a tax nearly equal to the whole tax upon malt and beer, when the price of the wines now imported is considered, was remitted—yet, notwithstanding of all this, the revenue has not been maintained, and the outlay by the country on wine is not greater than what it was before the reduction of duties took place.

As to the spirit-duties, the consumption, as well as the revenue, has been increased by their reduction. But here let it be remembered, that the tax, as regards Scotland, previous to the reduction, constituted more than one-half of the price of the commodity—the price being about 12s. per gallon, and the duty 6s. 7d., or a tax of upwards of 100 per cent.; this was reduced to 2s. 10d. In England, the price of the commodity was about 17s. per gallon, and the duty was 12s. 7d., or a tax of upwards of 300 per cent.; this was reduced to 7s. per gallon.

When this large remission of duties then took place, an increased consumption was naturally to be expected, from the principles which we have already stated, both with reference to the proportion which the tax bore to the cost of the commodity, and from the commodity itself being of a description which, among the great mass of its consumers, it was at least likely that the same sum should be expended on, whatever the price of it should be. If a labouring man had 2s. per week to spend in gin, it was not very likely, when the price was reduced, that he would restrict himself to the quantity which his

2s. formerly procured for him, but it was more natural to expect that he would expend at least the same sum on this source of his luxury, as it may be called ; and this, as we shall presently see, has been the case. In this respect, spirits are in a different situation from beer ; the one may be called a 'luxury, while the other is more a necessary of life.

The consumption of spirits in Scotland, during the three years preceding the reduction of the duty in that kingdom, which took place in 1824, and during the three last years, we find to have been, as given in the following statement :—

	Imp. Gall.	Duty.	
Year ending 5th January 1821,	2,024,882	L. 678,571	0 0
" " 1822,	2,074,883	692,747	0 0
" " 1823,	1,915,579	637,351	0 0
Average,	2,005,114	L. 669,556	0 0
Year ending 5th January 1827,	3,088,788	L. 565,078	0 0
" " 1828,	4,752,199	673,228	0 0
" " 1829,	5,716,180	809,792	0 0
Average,	4,819,055	L. 682,699	0 0

And if we take the price and the duty in conformity with what we have already stated, we have—

1. Price paid by the consumers annually for whisky, previous to the reduction of the duty,	L. 1,203,068	0 0
2. Price paid by the consumers annually since the reduction of the duty took place,	1,987,860	0 0
Difference, being the increased expenditure on whisky,*	L. 784,792	0 0

In England, the consumption of spirits for three years preceding the reduction of the duty, which took place in 1826, and

* We are aware that, in consequence of the suppression of illicit distillation, this result may not be altogether true ; and also, that it is subject to a correction on account of any difference which may exist in the price of the spirits, independent of the duty. When we refer, however, to the result which is exhibited in the case of England, we are disposed to consider that the former correction is generally supposed of more importance than it really is, and that as to the latter, any difference would not affect materially the general import of our reasoning.

for the three last years, was as follows :—

	Imp. Galls.	Duty.		
Year ending 5th January 1823,	3,699,826	L. 2,327,807	0	0
1824,	3,883,665	2,443,472	0	0
" " 1825,	3,518,674	2,213,832	0	0
Average,	3,700,721	L. 2,338,370	0	0
Year ending 5th January 1827, *	6,907,204	L. 2,417,521	0	0
1828,	6,671,562	2,335,046	0	0
" " 1829,	7,769,694	2,719,397	0	0
Average,	7,116,153	L. 2,490,654	0	0

And, holding the prices and duties as already stated, we have,

1. Price paid by consumers annually, previous to the reduction of the duties in England,	L. 3,145,612	0	0
2. Price paid by the consumers annually since the reduction of the duties,	4,062,137	0	0
Difference, being the increased expenditure on spirits,	L. 916,525	0	0

That such an increased consumption has taken place in spirits, following a reduction of the duty, must be ascribed to causes which could not be supposed to operate in the case of a repeal of the beer-duties. The reduction in the price of spirits following the remission of duty, was far beyond what could take place by a repeal of the beer-duties, and even greater than what would take place if the malt-tax were repealed at the same time. Beer is more a necessary of life, and we apprehend it will readily be admitted that a luxury such as dram-drinking, from the very effects which its indulgence produces, and on which a given sum was formerly expended by its votaries, on being greatly reduced in price, was much more likely to be extended in its use, than a necessary of life such as beer, would be, were its price only a little reduced. Much more could be said as following from what we have stated on this subject, but we think we have said enough to show, that any reasoning regarding the beer-duty by analogy from the wine and spirit duties, is absurd : and that to calculate on an increased consumption of

* We have deducted 500,000 gallons from the quantity of this year, as an allowance for the dealers getting into stock.

malt liquor from a repeal of the beer-duty, so as either to maintain the revenue, or be productive of any great good to the agriculturists, is really to anticipate what there is little likelihood, much less certainty, of taking place. If a repeal of the beer-duty is to be resolved upon by Government, it must be done with a certainty that a great decrease of revenue will follow, while the whole advantage to the consumer will be that he will be enabled to drink his beer at 1d. per pot cheaper than he does at present.

It will be seen, from a statement given at the commencement of these remarks, that the annual quantity of malt made into beer, but which pays no beer-duty, in respect that it is home-brewed, and is thus exempted by law from any tax, amounts to 648,872 quarters. If this quantity paid beer-duty in the same way as that brewed by licensed brewers, the duty would amount to about £700,000. To this extent, therefore, those brewing their own beer are exempted from a tax which other consumers have to pay; and these being generally of the middling and poorer classes of society, the beer-duty may be said to subject the poor to a tax from which the rich are exempted. The only ground upon which we have heard it attempted to justify this invidious and improper distinction, has been the impracticability of levying the tax. But this we regard as no reason at all, so long as the remedy can be so easily applied, by laying the whole duty at once upon the malt. Were this done, the malt-tax would then become the beer-tax wholly, and it would affect all consumers of malt-liquor equally. The effect of the measure, at the same time that it abolished this anomaly of the law, would be beneficial in other respects, as removing many of the restrictions at present imposed upon brewing, requiring increased expense of Excise attendance. In respect of the inequality referred to, the beer-duties must ever be regarded as defective and unjust, and the law regarding them should not be allowed longer to disgrace our statute-books. It is to be observed, that the whole amount of the beer-duty would not need to be imposed on the malt, because a larger quantity of malt would now be subject to the tax.*

* At several county and other meetings, we have observed, that a feeling seems to exist in favour of the repeal of the Malt, rather than of the Beer

It is a remarkable fact, as shown by an official document laid before Parliament, relative to the malt-tax, that the consumption of malt liquor has remained stationary in England for the last forty years, and we believe it admits of being shown that this has been the case for a much longer period, extending to nearly a century. It has naturally been asked, how this has arisen in the face of the increased wealth and population of the country, which have had the effect of increasing the consumption of every other necessary and luxury of life in so remarkable a degree. Without having entered further on the question, the cause has been ascribed to the heavy duty on malt, and to the many restrictions which have been imposed on the manufacture and sale of beer. The healthy beverage, malt-liquor, it has been stated, was always the favourite drink of the English, and as no one can dispute its superiority over the various substitutes which have usurped its place, so nothing but excessive taxation and improper restrictions in the manufacture and sale of the commodity, could have produced so injurious a change. This has been urged as a strong reason for a repeal of duties producing such effects ; and could it be shown that the malt-tax has really produced such effects, a strong reason would exist for its repeal. But we apprehend that any falling off in the taste of the people for their favourite beverage, can with more reason be ascribed to causes with which the change of times has more to do than the malt-tax. Whether we regard malt liquor as a necessary, or a luxury of life, it will readily be admitted that, in the extended use of tea, coffee, spirits, wines, and similar commodities, it has had competitors enough ; and the effect which these have had in checking or diminishing the consumption of the good old ale, has doubtless been influenced by that powerful agent in influencing men's thoughts, as well as tastes—fashion. It is not surely on account of the high tax on beer that it has ceased to adorn the royal breakfast-table, as in times of old, and it is surely not because it is dear, that it

duty. Now, we cannot see the expediency of this preference. Such a measure would manifestly have the effect of throwing nearly the whole beer-tax upon the poorer classes of the community, and would thus increase what ought to be regarded as the most objectionable part of the law, namely, that by which those who have the means of brewing their own beer are exempted from the duty.

has now almost ceased to be admitted into the meals of the better classes, or even of the middling ranks of society. This we say cannot have been caused by the high price of beer, seeing that more expensive substitutes have been introduced. It is all very well for masters to impress upon their servants, that beer is more wholesome than spirits, and more strengthening than tea, yet we suspect that fashion and example in this case, as in many others, would be more effectual than precept. Other commodities which have most obviously come into competition with beer, have been increased in consumption, in spite of all the enormous taxes imposed upon them; and it is surely absurd to say that taxes operate thus unequally, and have turned the taste of the nation from an article of consumption, moderate in price, and moderately taxed, comparatively speaking, to others which are both expensive and highly taxed.

But while we lament the loss of the taste for malt-liquor, and question the efficacy of any legislative enactments to restore it, we are yet far from thinking that these may not in some degree affect the future consumption of it. Beer may be regarded in some respects as a necessary of life, and in other respects as a luxury,—the former, in so far as it is used by the working classes at their meals, and a luxury in so far as it is used as the promoter of their mirth and festivity, during the hours of their leisure. Now, in the latter situation, spirits come into the most general competition with it, and may, either from caprice or cheapness, usurp its place; and should the taste for them be once obtained, it is plain that it may produce an effect on the use of beer, even as a necessary of life. That such an effect has yet been produced, immediately from the late reduction of the duties on ardent spirits, does not appear from the official accounts; the same quantity of beer having been annually brewed since the reduction took place; but that it will ultimately operate as a check to the consumption of malt-liquor, we should say is extremely probable. A taste for spirits, however obtained, is seldom or never found in connexion with one for beer, so that, if we extend the taste for spirits, a limited demand for malt-liquor may be produced. Inasmuch, then, as it may be desirable to encourage the consumption of malt-liquor, does it become expedient to restrain the use of ardent spirits. But there may be other

grounds for restraining the use of ardent spirits, of more importance than the mere continuation of the consumption of malt-liquor, or the extension of it; and we apprehend such considerations will be manifest, when we regard the effect which a low price of spirits is calculated to produce upon the moral habits and comforts of the people. The question of the expediency of a reduction or increase of duties on ardent spirits has, we think, been too much confined to discussions between distillers and brewers, with reference to the conditions of their respective trades. But however important to the individuals interested such considerations may be, they are not the only ones to be regarded when considering the question, in a national point of view. We should be sorry to see our legislature act upon general principles, without regard to private interests; but surely if a low price of ardent spirits, is found to be prejudicial to the community, it should not be an argument against the increase of that price, that beer is less taxed than spirits.

As regards the national importance of the two interests, it is to be observed, that the brewery is the more important, both with reference to the quantity of capital which it employs, and with reference to the quantity of grain which it consumes. There is an annual consumption of upwards of 2,700,000 quarters of malt in the breweries of Great Britain, independently of nearly 700,000 quarters used in private brewing; while, supposing one bushel of grain or malt for every two gallons of spirits made, the grain and malt taken together, which are used in the distilleries, will not exceed 800,000 quarters annually. At the time of reducing the duties on spirits, much was said of the benefits to be derived from the extension of distillation, both by the suppression of smuggling and the increased consumption of grain. The suppression of illicit distillation cannot be said to have benefited the agriculturists, because the same quantity of grain would, in both cases, be used; and as to the increase of consumption, we have already seen that it has just been doubled, consequently that the increased consumption of grain must have been somewhere about 850,000 quarters. Now, really, with reference to the general consumption, this is trivial enough; and when it is considered that a great part of this increased consumption has been supplied by foreign importation of the lighter

descriptions of corn, we conceive, that, for the agriculturists, as a body, ever to have hailed the measure of a reduction of the duties on spirits as one likely to have materially affected them, or now to oppose an increase of duty, on the ground that it may distress them, is really giving the thing an importance which we are certain will be lessened in their estimation when these facts are before them.

We have already shown, that, since the reduction of the duties on spirits, the annual consumption has been, in

	Imperial Gallons.
England,	7,116,153
Scotland,	4,819,055
Together,	11,935,208

While, before the reduction took place, it was, in

	Imperial Gallons.
England,	3,700,721
Scotland,	2,005,114
Together,	5,705,835

so that the difference, being upwards of 6,000,000 gallons, is the annual increased consumption. When we reflect that this must have taken place almost wholly amongst the lower orders of society, it will surely not be surprising that drunkenness has increased, and that crime has followed as a consequence. Comparing the year 1823, with that ending 5th January 1829, we have it proved to us by official documents, that more than double the quantity of spirits has been consumed, while the same quantity of beer has been used, and this notwithstanding of the unfavourable change which is supposed to have taken place in the condition of the working-classes. In spirits alone, upwards of L. 1,000,000 Sterling, on the most moderate estimate, was expended during the year 1829 beyond what was done in the year 1823; and thus the labouring classes have not only expended the same sum from their incomes, on spirits, procuring nearly a double quantity, but they have expended a greater sum than they did in the year 1823, and that from a diminished means of livelihood. The Chancellor of the Exchequer, when a reduction of the duty on spirits in England was opposed in 1826, on the ground of the tendency of such a measure to demoralize the people, stated, that he was told the same thing when he reduced the duty in Scotland in 1823, but that the fact had been, by experience, proved otherwise. We wish it

had been so; but we fear that such a statement cannot now, if it even could then, be borne out by fact. We fear the prediction, that evil would come of the measure, has been but too exactly verified, and that the late and present distresses of our labouring poor have been dreadfully aggravated by the increased consumption of ardent spirits.

Such effects having manifestly resulted from the last reduction of the spirit duties, the inexpediency must now be apparent of Ministers ever having meddled with these duties at all; and, it is to be trusted, that Parliament and the Country will now see the strongest reasons for recurring to the former rates at least. Smuggling may doubtless be somewhat increased by such a measure; but surely the condition of a few, in an inconsiderable part of the kingdom, is a trivial consideration, when compared with the moral effect on a whole nation; and if Government should find it necessary, even to double the number of their officers in those districts, we hold that the evil would be a small one in comparison with the object to be gained. If these duties were to be doubled, we think the effect in checking the taste for ardent spirits, at least for a time, would not be considerable; but this should form no argument against the adoption of sounder principles, calculated to check the progress of a great public evil. We conceive the duties on spirits to be of the nature of those in which, in taxation, it will be found that two and two really make four; and should this be so, an increase of them may admit of a remission of taxes which may prove a great blessing to the nation, without any loss to the revenue. At all events, an increase of the duty on spirits, if it did not restore the old taste for small liquor, would tend to check the use of those noxious substitutes which threaten to destroy it altogether.

Let us suppose that the duties on spirits were increased, and consider what would be the effect as regards agriculture. If the consumption were maintained, the agriculturist would be in no worse situation, and the revenue would be increased about L. 8,000,000 Sterling annually. Such an increase would then admit of a repeal of the beer-duties; and although this might not increase the consumption of malt-liquor, it would still be calculated, in some degree, to counteract its diminution, and so be likely to preserve both sources of present demand to

the agriculturists: If, on the other hand, the consumption should be brought back to what it was in 1833, the revenue would be the same as it is now; and should the agriculturists so lose the benefit of a demand for about 350,000 quarters of grain, they would still have taken the most likely means of preserving the demand for the brewery. If they injure the brewery to the increase of the distillery, they not only gain nothing, because an equal sum expended in spirits, or in malt-liquor, consumes just about the same quantity of grain; but while it is possible that the taste for malt-liquor may be very much injured by that for spirits, it by no means follows that the extent of injury done to the brewery would be compensated by a corresponding increase in the distillery. Indeed it is hardly possible that distillation could admit of being carried to such an extent as to compensate to the agriculturists a very slight injury inflicted on the brewery; and if we suppose that the brewery were diminished one-third, it would require even the present great increased consumption of spirits to be doubled, so as to compensate the agriculturists,—an occurrence which we hope, from the deplorable condition to which it would reduce our labouring classes, will never take place; and indeed we cannot see how it could take place.

It now only remains for us to examine how far the consumption of malt liquor may be said to have been checked or diminished, in consequence of the restrictions imposed by law on the manufacture and sale of it. As regards the forms of excise, we must remember, that general writers, ignorant of the many means and ways of evading the operation of revenue laws, are, at any time, but poor authority in such matters. The statements of parties interested ought always to be received with caution, inasmuch as excise laws, even in their most simple forms, must, at all times, and under any circumstances, be obnoxious; and where the temptation to evade them is great, it should not surprise us that many and loud complaints are made. The late remission of some of the more obnoxious enactments for the manufacture of malt, should satisfy the public that those who have the charge of such matters are not inaccessible to reasonable representations; but the caution requisite, from the difficulty of foreseeing every device of a man who is disposed to evade duties, must necessarily be great, and is proved to be

indispensably necessary. If, then, a revenue is to be raised, obnoxious restraints must be submitted to, and, in the many of our national manufactures on which they are imposed, we have never heard it contended that their real prosperity has been thereby affected, and we cannot see any reason for thinking that such restraints have proved more injurious in the manufacture of beer than of other commodities. But as respects the sale of beer, there exists a regulation commonly and well known by the name of the "Licensing System," with which most of our readers are no doubt sufficiently acquainted, from the many times it has been brought before the public, both in and out of Parliament.

This system, regarding which so much has been written and said, and to which evils of the greatest magnitude have been ascribed, consists in the power which the County Magistracy, or Justices of the Peace, in England, have of authorizing such, and as many public houses for the sale of beer, as to them shall appear proper and necessary for the supply of their several districts. By a recent act, the Justices of the Peace in Scotland are invested with similar powers; but these have been so little acted upon, if they can be said to have been exercised at all, that the system may be regarded as confined exclusively to England. This power is given to the Justices in consequence of its having been considered necessary by the legislature to restrain, within proper bounds, the number of public houses, from the tendency which they naturally have to become the haunts of the idle and disorderly, and so encourage drunkenness and dissipation.

Certain houses have, under this regulation, from time to time been licensed in certain districts; and, as it has not been usual for the Justices to deprive the house of its license, whatever change might take place with respect to its tenant, it has naturally followed that brewers have, in many cases, become the proprietors of such houses, or of the leases of them, and have thus acquired the power of obliging the tenants to use no other beer than what is manufactured by their landlords. The brewers of London and elsewhere, have long been large holders of this kind of property; and the power which they thus acquire, constitutes what is called the "Brewers' Monopoly."

The effect of monopoly, properly so called, is when one man, or a set of men, such as the East India Company, has the power

of regulating the supply, so as to regulate the price. To give the brewers, therefore, a monopoly, in the proper sense of the word, they must have this power; and, before they can have it, three things must be supposed. First, That the brewers throughout England and Wales are in concert with each other; Second, That they are proprietors of all the licensed houses; and, Third, That the Justices of the Peace in England are in league with the brewers. The first of these requires the co-operation of too numerous a body, the individual members of which are well known not to be on the best of terms with each other; the second is not true, in point of fact, as a limited number only of the licensed houses are the property of brewers; and the third is too ridiculous a charge to be brought against such a body as the Justices of the Peace of a whole country like England. A monopoly thus fettered by so many restraints and contingencies, can never be very complete; but, further, as already seen, the home-brewed beer is exempted from any duty whatever, so that if the people were charged with a monopoly price, it may well be supposed that the power of home-brewing would be more resorted to than it now is, and this the more, seeing that a premium is really given for doing so in the present exemption from the beer-tax. The brewers' monopoly, therefore, must be regarded as a very imperfect one indeed; but so many bad effects have been ascribed to it,—even the agricultural community have been made to believe that they have a great interest in its abolition—that it really becomes of importance to examine the matter a little farther. In investigating the subject, two considerations naturally present themselves to our notice; the first being how far the Licensing System really tends to raise the price of beer, and so prove injurious to the consumers, by raising the price, and to the agriculturists by checking the consumption; and the second being, how far such a regulation is proper or desirable at all, as a part of our police regulations.

That the natural tendency of restraining competition in any trade, is to keep prices higher than they would be under a free competition, no one will deny; but that sufficient competition may not exist among a limited number of traders, so as to admit of prices being at their lowest rate, does not necessarily follow from this general proposition. Thus, the selling rate of any

commodity may be supposed to be at the lowest remunerating price, and sold by the traders in that commodity throughout the kingdom accordingly; but it does not follow that a mere increase of their number would reduce the price, although it would further divide the trade; so that from the mere circumstance of the retailing of beer being confined to a certain number of retailers, it does not follow that the competition among them may not be such as to keep prices at their proper level. But it has been said that licensed houses bear a higher rent than other houses, and that the brewers pay a higher price for the leases of such houses than they would do for any others; and having thus large capitals invested at a high rate, they must remunerate themselves for this, by charging a higher price for their beer to the public—and this has been represented as an indirect tax paid by the public on beer. If we suppose that, in a certain town, the annual consumption of beer amounts to L. 3000, and that the profit on beer is 10 per cent.; if this is sold by one publican, who pays L. 150 of rent, which suppose to be double what he would pay were there no Licensing System, he will draw, in the first place, L. 300 of gross profit, and, after paying his rent, he will have L. 150 net profit to live upon. Now, supposing that the Licensing System were abolished, and that the business is now divided among three publicans, who have each to pay a rent of L. 75, being one-half of what the former publican paid; in this case, each publican would draw L. 100 of gross profit, but after paying his rent, he would only have L. 25 left, while, when one man had the whole business, he could not only pay double rent, but have a comfortable means of livelihood. In this case, we can see little probability of the price of beer being reduced; but, on the contrary, we can conceive it very possible that it may be raised. It is not necessary, however, to suppose either the one or the other; all that we contend for is, that the first publican, by getting the whole trade, could afford to pay an additional rent, without injury to the public. The abolition of the system may be very well, and very advantageous, for the householders, because there may be supposed a demand thus created for two extra houses, which they would thus be enabled to let; and it may be very fair that the two other publicans should have a share of the profits of selling beer as well as

their neighbour, and, in reference to these parties, the abolition of the system may be very desirable; but the measure is one with which the beer-drinkers have less to do than perhaps they contemplate. But to take another illustration: Let us suppose that, by a law to be passed, the retailers of tea or any other commodity in any given town, were restricted from 100, their present number, to ten, would not the increased trade which each of these ten would thus acquire, enable them to pay an increased rent for their shops, without their being obliged to raise the price of tea? We apprehend that there are very few who would not undertake to deal upon such terms, if the law were to give them the power; and, if this were the case, the measure would, no doubt, be very unjust towards the other ninety dealers, who would thus be deprived of their business; but that the effect of it, in so far as the consumers of tea were concerned, would be injurious, is not a consequence. The good-will of any business, which is neither more nor less than a power of commanding a given sale, is always valuable in proportion as it is likely to secure this, and will always command a price in the market; but we never heard it contended, that the necessary consequence of this was to raise prices, or that it formed a tax upon the community. The increased rents, then, of public houses, is precisely in this situation—they are premiums which will be readily given by brewers or publicans for a business, in the same way as would be given by any man for any business whatever; and if the law thus enhances the price of a house, by bestowing upon it privileges, which, for reasons good or bad, it denies to another, it may be a very improper and invidious distinction; but that the effect of it is either to enable or oblige the seller of beer to procure a higher price than its real value from the public, is as ridiculous as to say, that, because a medical practitioner sells his practice to a successor for L.2000, the unfortunate patients are thereafter to be charged with extra fees.

The employment, then, of capital by brewers in the purchase of the leases of these licensed houses, appears to us to be as legitimate as it is for a man to purchase the good-will of a business. We can see no difference; and we believe that the brewers, for their own interest, will take as much care in endeavouring to maintain the character of any house which they may purchase, as a man would do in any other case.

Any power which the law gives them under the Licensing System, would not protect them from the evil consequences which an opposite course must infallibly produce; and the best practical illustration which can be given, is by reference to the London great breweries, whose extent of business, as publicly seen every year, varies very much in proportion as the several houses stand in public estimation for the quality of their beer.

But while we are not borne out by general reasoning, in holding that the effect of the Licensing System is to raise prices; neither are we supported by fact. It has already been observed, that Scotland may be said to be exempted from its operation, so that by a comparison of the state of the trade in the two kingdoms, a pretty good means of comparison between the effects of a free and strict licensing system may be obtained. There being no two descriptions of beer precisely of similar qualities made in the two kingdoms, no comparison can be correctly made between brewers' prices, but it can easily be done between retailers' profits; and, as the English brewers sell their beer at the same rate to the houses, of which they are themselves the proprietors, as they do to the free houses, or to any person who chooses to purchase from them, the increased price, in consequence of the increased rents of the houses, must, if taken at all from the public, be drawn by the publican.

The selling rate of porter in London being 50s. per barrel of 36 gallons, or 144 quarts, it is retailed to the public at 4½d. per quart. In Scotland, the strong ale sold to the publicans at L. 5 per hogshead, or 66s. 6d. per barrel of about 39 gallons, is retailed at 5d. per bottle by a certain class of the dealers, and 6d. by the lower class of publicans. Now, supposing the bottle to be of the largest size in use, which it seldom is, or 15 to the 19 quarts, and correcting the brewers' price in Scotland for the difference of credit and discount allowed to the retailers, and holding it to be 66s. per barrel, we find that the ale should be sold at 4½d. per bottle, to be in proportion to the London retailers' profits; in place of either 5d. or 6d.; thus showing, that the public do not pay a higher price to the retailers in England than they do in Scotland, but the contrary. Similar results could be exhibited with reference to the comparative rate of prices of spirits, but it would lead us into a detail which would be somewhat out of place.

We come next to consider how far the Licensing System is desirable, or proper, as a part of our police regulations. Every such regulation ought to have for its end the general good, and restraints, which are necessary for the well-being of the community, may not unfrequently be found to lead to cases of individual hardship. The object of licensing dealers in spirits and beer, has already been alluded to, as being to restrain the increase of public houses, regarded as evils to the community, from the tendency which they have to become the resort of the idle and profligate. A wholesale dealer selling a quantity amounting to 4½ gallons of beer, or 2 gallons of spirits, to any individual, is not interfered with by what is called the Licensing System; and it is only in the case of retailers, or publicans, who sell directly to the public in small quantities, such as quarts or bottles, that the system has been reprobated, as creating a monopoly to the brewers and retailers. We have already seen that the effect of the system is not to raise prices—that, in point of fact, it has not done so; but, on the contrary, by concentrating business, has very possibly lowered them, so that the only injury which can be said to be inflicted by its operation, is the depriving of the wholesale dealers of the power of selling by retail, and the preventing every person, but those licensed, from becoming publicans. But we apprehend, that, if the restriction of the number of public houses is otherwise a good to the community, the individual hardship of the few who may thus be deprived of the power of directing their attention to this business, should not be made an argument against the good of the many. To argue to the contrary, is to confound a principle of free trade with a municipal regulation.

The effects which a strict licensing system produces on the condition of those employed in the trade, may perhaps be illustrated by contrasting the state of the lower classes of public-houses in Scotland and in England. The contrast is too remarkable to have escaped the notice of any one who has visited the two countries. In the one, we find a certain appearance of neatness and comfort; in the other, the most wretched pictures of disorder, filth, and poverty. In the cities of the one we see, at reasonable distances, respectable, bustling, business-like houses; in those of the other we are disgusted by the sight of drunkards issuing from the doors of innumerable li-

censed hovels in every corner. In England, a publican is generally a man who may be said to have been brought up to his business; in Scotland, the trade is the last resource of bankrupts, of idle half-working servants and labourers. Nothing can be more deplorable than the circumstances of the families of the lower publicans in Scotland in all their relations; and nothing can be more pernicious than the facilities which the innumerable little licensed tap-rooms in every street give to the encouragement of dishonesty and bad conduct among the servants of every family in every town in Scotland. A man there who becomes a publican does not sit down to make a business calculation of profit and loss, like a man who becomes a meal-dealer, a haberdasher, or any other trader. The general history of almost every one of them is so much alike, that one example will suffice for our purpose. A labouring man has a liking for whisky and good fellowship, and he bethinks himself of combining the trade of publican with his other pursuits; he removes his wife and family to some little shop suitable for the purpose; he goes to a spirit-merchant and purchases a gallon of whisky and a few dozens of ale and porter, amounting in all to perhaps 20s., with which, after paying a small sum for a license, which he easily obtains, he is ready to begin the business. This is forthwith given over in charge to the wife during the hours of his work; and mine host in the evening presides as the entertainer of all visitors who may require his services. He soon finds, however, that public-house-keeping and hard labour but ill agree; that it is difficult to sit both late at night and rise early in the morning; and he accordingly restricts himself to half work. Even this he soon finds to be irksome, and he then becomes publican only. It seldom happens, however, that a business thus hastily taken up, under the auspices perhaps of a few of his fellow-workmen, is found to answer the purpose of the maintenance of his family, so that in a very short time he is a bankrupt. By this time all relish for hard work has been lost, while his family has perhaps been driven to less creditable courses, for supporting the failing finances of the "Rising Sun;" so that, to return to his former mode of life, he finds to be impossible. He changes his shop, by commencing business again in another part of the town, with a new name, and a new sign, but this trick is generally as unsuccessful as the original

speculation, till at length his family is dispersed, he himself becomes a wandering vagabond, without home and without friends, a fitting subject for the prison and the treadmill*.

That this history of a great proportion of the lower publicans in Scotland, owes nothing to the imagination, we can safely assure such of our English readers as may be groaning over the fancied evils of licensed public houses, and the brewers' monopoly. There are, no doubt, many sober and decent people among the publicans of Scotland, but these form the exceptions, and suffer in common with the community in the evils which this unnatural overflow of competition, arising from circumstances which do not exist in any other business, necessarily inflicts. When we consider the proportion which these small public houses in many towns and districts bears to the number of the inhabitants, being, in some cases, one for every twenty people, and that the publicans themselves generally stand in a certain relation of companionship to the working classes, and thus very naturally exert all their influence among their former friends for support in business, can it be doubted that this has the effect of inducing drunkenness, and promoting habits all but consistent with the true comfort and happiness of the people? We are far, indeed, from wishing to interfere with the little enjoyments of the poor, to which they have as good a right as the most wealthy: but we cannot see how we should be doing so by giving them comfortable places of resort, or by their being supplied with spirits and beer by a better and more respectable class of dealers. These small publicans, from the state of their credit, always pay a high price for the very worst of articles; so that the practical truth is, that their customers must be, and are, supplied with liquor of the worst quality, and charged at the highest price.

Such and many others are the practical evils resulting from an unrestrained competition in the public houses in Scotland. The late Licensing Act, giving the Justices of the Peace of that country similar powers with the English Justices, has as yet been

* We remember a poor man, originally a mason, who had a liking for any thing rather than the trowel and the hod. After trying many occupations, and succeeding, as may be supposed, in none, he came to that city, named by its modest inhabitants "Modern Athens," where he set up as publican, under the expressive sign of "The Last Shift," but after running the usual course of the trade, he disappeared, and we have long since lost sight of him.

slightly acted upon; but we are very certain that the more the state of the public houses in Scotland is inquired into, the more reason will there be seen for restricting them, as in the sister kingdom; and the Justices of Peace there should not be deterred from the full exercise of their legal powers, by the fear of inflicting any injury on the community. The refusing of a license may be an individual injury, but it ought rather to be submitted to as the lesser evil. If this course is steadily persisted in, the community may hope to have the benefit of comfortable inns and good accommodation throughout all the various districts of Scotland, instead of those miserable hovels which now disgrace it. We have been induced to dwell a little longer on the licensing system than is, perhaps, altogether consistent with our present inquiry, though, at the same time, we have not gone into the subject so fully as we should have done, had we had it alone under consideration. But we think we have said enough to show that the evils of it are, at least, less than have been generally represented; and that, to attempt to ascribe any consequences from its abolition, to agriculture, is really an effort to enlist those in a cause who have very little to do with it. Our friends, the agriculturists, it is generally thought, make demands enough of the Legislature; and it is really too much to endeavour to bring them forward to plead for householders, and for competitors for a share of the beer and spirit trades. We hope they will rather direct their attention to matters in which they have a real and substantial interest.

In concluding these remarks, we have to observe, that we are well aware that there are various collateral considerations connected with the general question; though none of them, so far as we can judge, can be said to interest the agriculturist otherwise than as a general member of the community. In considering a subject of this nature, the first object of the inquirer should be to obtain a knowledge of facts; but we regret to observe, that, in the public debates to which the question has given rise, the feelings of parties seem to have been more appealed to, than sober business-like calculation. Not only in the casual discussions which have arisen, but in the Resolutions of large bodies of men, we find propositions laid down and maintained, which receive no support from the facts of the case, as shown by existing documents. In the very last production of this kind, under the

form of *resolutions*, which has come under our notice, we find it gravely announced, that the tax on beer is 200 per cent. Now we need not revert to what has already been observed by us on this subject, to show, that the averment in question overrates the real tax on beer by nearly 400 per cent., and that the tax on beer is greatly less than that on other commodities of daily consumption, and in universal use in the country. But, in the public discussion of this whole question, as of many others that might be cited, it is obvious that the existing state of things has been represented as fraught with evils which do not exist, and that the little defects which must necessarily accompany all regulations in trade with a view to revenue, have been heightened by gross exaggeration. As to the total repeal of the malt and beer duties, we have seen that it is what, in the present state of the finances of this country, cannot be effected, and ought not to be demanded. The duties are of that nature, that even if they could be spared in respect of the revenue, we hardly think it would be expedient to abolish them entirely, for although we may now be in a state of peace, it is plain that the moment we are involved in a war, it will be indispensable to have recourse to them. As to the repeal of the beer-duties alone, we have endeavoured to estimate, upon what we consider good data, the extent of the benefit likely to be derived from the measure. We have seen that this benefit is, under the most favourable view, likely to be but trivial, if any thing at all, but with the certainty of a great diminution of revenue being produced—and surely no thinking man will assert, that a great diminution of revenue would not be a public evil. In the course of our remarks, too, we have taken occasion to recommend an increase of the duties on spirits, and this on two grounds. *First*, Because such a measure would be calculated to preserve the demand for barley in the brewery, which, as affecting the interests of agriculture, is more important than the distillery; and, *second*, Because a low price of spirits is prejudicial to the morals and happiness of the people. As regards the question of the licensing system, we trust our agricultural readers will see, from the statements which have been submitted to them, that it is one, in the agitation of which they have greatly less concern, than the parties really interested would lead them to believe.

MISCELLANEOUS NOTICES.

I. On the Adulteration of Milk.—The subject of the adulteration of milk has been lately investigated with great care, by M. Barruel of Paris. Although his observations are intended to apply only to the milk of that city, yet there is little doubt that they will also be found applicable in a greater or less degree to all great towns. He sets out with stating that all instruments for ascertaining the purity of milk, which are calculated to attain this end by pointing out differences in its density or specific gravity, are inaccurate and useless. For, on the one hand, pure milk differs much in density according to the fodder used by the dairy-man for his cows, the butyraceous matter which imparts lowness of density, being made to preponderate by some sorts of food, and the caseous part, which increases the density, being made preponderant by other sorts. And, on the other hand, although water, the ordinary substance with which milk is adulterated by the dealers in the French capital, would alone cause a great diminution of density, the dealers know very well how to prevent that effect, and so render the areometer useless. For this purpose, it is only necessary to dissolve in the milk a little sugar-candy, which is required at all events in order to correct the flat taste imparted to milk by diluting it with water. The result of M. Barruel's inquiries on the adulteration of milk in Paris, is, that no positively noxious substance is ever to be found in it; that a common practice is to remove a considerable portion of the cream, by allowing the milk to stand for a limited time, and then to dilute the remainder, or skimmed milk, with water, and to give it the apparent qualities of new milk in one or other of the manners now to be mentioned. The opacity of the milk being much diminished by the water, so that the milk acquired a bluish appearance, it was at one time usual to correct this defect, by previously mixing wheat-flour with the water with which the milk was diluted. But this adulteration was too obvious to the senses. Any person even of indifferent delicacy of palate, could detect the altered taste of the milk; and besides, after two hours' rest, the flour sank to the bottom, restoring the translucent blueness of the milk, and pointing out the nature of the fraud. To prevent this inconvenience, the dealers boiled the flour in the water before mixing it with the milk; and in this way an opaque mixture was procured, which retained its opacity on standing. As even with this addition the fabricated liquid had a flat taste, sugar or sugar-candy was dissolved in it, by which means the peculiar sweetness of the milk was partly restored. This adulteration, however, has become so easy of detection by means of iodine, which renders the mixture blue by its action on the fecula of the flour, that M. Barruel believes that the fraud now described is very little practised in the present day at Paris. In Britain, where the municipalities take no charge whatever of the purity of this most important article of food, it may be presumed that the adulteration with flour, sugar, and water is common enough, as it is a simple and cheap mode of accomplishing every purpose of the fraudulent dealer. The best mode of proving the presence of farinaceous matter in

such mixtures, is to heat the milk with a little sulphuric acid, to coagulate the casein, to filter the whey, and then to add to the latter the tincture of iodine; upon which a fine blue colour will be struck. Driven from this species of adulteration, the Parisian dealers have latterly resorted to another so ingenious, that M. Barruel conceives they could not have discovered it, without the aid of some scientific person. The method is simple, so cheap, that for tenpence the opacity and colour of milk may be imparted to thirty English pints of water, and so far secret that no disagreeable taste is communicated. This is nothing more than the employment of an emulsion of almonds, for which some dealers, more greedy and less cautious than the rest, have substituted hemp-seed, which, however, is apt to impart an acrid taste. By either of these means the milk may be diluted to an indefinite extent; and the only corrective required is a little sugar-candy to remove the flat taste. A peculiar advantage possessed by this mode of adulteration over every other, is, that the vegeto-animal matter, or vegetable albumen of the emulsion by which the oil of almond is held in suspension, is coagulated, or curdled, like casein, by acids. The method recommended by M. Barruel for detecting the fraud is founded on two circumstances,—the greatly inferior quantity of coagulum formed by acids in the mixture of milk and almond emulsion, compared with that formed in milk alone, and the facility with which, by kneading the coagulum with the fingers, oil may be squeezed out of the former, while none exists in the latter. On examining carefully four different specimens of pure milk, procured from different quarters in Paris, he found that 360 parts of each, coagulated by heating them with an equal volume of vinegar, gave each a quantity of curd, which, when well drained, and equally pressed between folds of bibulous paper, weighed 29 parts; and that the same quantity of milk taken from a cow in presence of a person sent to procure it, gave 30 parts of curd. He then found, that when the same milk was mixed with various proportions of water, the quantity of curd was exactly in the inverse ratio of the proportion of water added. The water, therefore, did not prevent any portion of the curd from being thrown down by the usual modes of curdling the milk. He next found, that, if a given quantity of sugar was added to the mixture of milk and water, the quantity added could be separated exactly by evaporating the whey to the consistence of an extract, heating this with alcohol, filtering the alcoholic solution, and evaporating to dryness. He then also found that, when equal parts of almond emulsion and milk were mixed together, 300 parts of the mixture, curdled by vinegar as above, gave 16½ parts of curd; and that the same quantity of a mixture containing two parts of emulsion to one of milk, gave only 10½ parts of curd. So that although, as was to be expected, the adulteration with almond emulsion did not lessen the quantity of curd to the same extent as adulteration with water only, yet the decrease was very great, and very nearly in the ratio of the quantity of emulsion added. Lastly, on placing pure curd on white paper, no oily matter was thrown out; but the curd procured from the mixture of milk and almond emulsion, besides being less firm than the former, gave out in 24 or 48 hours a quantity of oil sufficient to stain the paper. Another adulteration to which milk is subjected in Paris, is with carbonate of potass or soda. The object of this variety of adul-

tation is, in the hot summer months, to prevent the milk from becoming sour and curdling, or to break down the curd and correct acrescency when the milk has actually become spoiled. In this process, acetate of potass or soda is formed. Neither of these salts, in moderate quantity, is injurious to the health; indeed, acetate of potass exists naturally in milk, and is the source of some embarrassment in the detection of the present fraud. The mode of analysis adopted by M. Barruel is as follows: As the alkaline acetates are converted by incineration into carbonates, he endeavoured, by means of this property, to ascertain the quantity of alkali naturally contained in whey. He therefore evaporated a certain quantity of whey to dryness, incinerated the residue in a platinum crucible, and procured an alkaline ley from the remainder, which, by the process recommended by Decrioil for measuring the strength of alkaline fluids, indicated from one and a half to two degrees of alkalinity. Hence any increase of alkaline strength above the last of these points, must be considered as owing to the intentional addition of carbonate of potass or soda. This is evidently the most difficult of the processes recommended for detecting the various adulterations specified in M. Barruel's paper. Indeed, a chemist alone could conduct it. The others may be easily executed by any body.—*Edinburgh Medical and Surgical Journal*.

2. *The Barberry*.—This tree is a native originally of the eastern countries, though it is now found in most parts of Europe, where it thrives best upon light and chalky soils. It grew formerly wild, in great quantities, in the hedgerows of England, but has been universally banished, from a general belief that its presence is injurious to the growth of corn. Duhamel, Broussonet, and other scientific writers, treat this belief as a vulgar prejudice. It should, however, be remarked, that the fructification of the barberry is incomplete, unless the stamens be irritated by insects, when the filaments suddenly contract, in a most remarkable manner, towards the germ. The flowers are, therefore, by a beautiful arrangement of nature, peculiarly attractive to insects; and thus the barberry may become injurious to neighbouring plants.—*Library of Entertaining Knowledge*, vol. ii.

3. *On the Food and Habits of the Common Rook*.—Gesner has called the common rook (*Corvus frugilegus*) a corn-eating bird. Linnæus has somewhat lightened this epithet by considering it only as a gatherer of corn; to neither of which names do I believe it entitled, as it appears to live solely upon grubs, various insects, and worms. It has at times great difficulty to support its life; for, in a dry spring or summer, most of these are hidden in the earth beyond its reach, except at those uncertain periods, when the grub of the chaffer is to be found; and, in a hot day we see the poor birds perambulating the fields, and wandering by the sides of the highways, seeking for and feeding upon grasshoppers, or any casual nourishment that may be found. At those times, was it not for its breakfast of dew-worms, which it catches in the grey of the morning, as it is appointed the earliest of risers, it would commonly be starved. In the hot summer of 1693, many of the young brood of the season perished for want; the mornings were without dew, and consequently few or no worms were to be obtained; and we found them dead under the trees, having expired on their roostings. It was particularly

distressing, for no relief could be given, to hear the constant clamour and importunity of the young for food. The old birds seemed to suffer without complaint; but the wants of their offspring were expressed by the unceasing cry of hunger, and pursuit of their parents for supply, and our fields were scenes of daily restlessness and lament. Yet, amid all the distress, it was pleasing to observe the perseverance of the old birds in the endeavour to relieve their famishing families, as many of them remained out, searching for food, quite in the dusk, and returned to their roosts long after the usual period for retiring. In this extremity it becomes a plunderer, to which by inclination it is not much addicted, and resorts to our our newly-set potato fields, digging out the cuttings. Ranks are seen sadly defective, the result of its labours I fear; and the request of my neighbours now and then for a bird from my rookery, to hang up *its arvorem* in their fields, is confirmatory of its bad name. In autumn, a ripe pear, or a walnut, becomes an irresistible temptation, and it will occasionally obtain a good share of these fruits. In hard frosts, it is pinched again, visits for food the banks of streams, and, in conjunction with its congener, the "villain crow," becomes a wayfaring bird, and seeks a dole from every passing steed. Its life, however, is not always dark and sombre; it has its periods of festivity also. When the waters retire from the meadows and low lands, where they have remained any time, a luxurious banquet is provided for this *corvus*, in the multitude of worms which it finds drowned on them. But its jubilee is the season of the cock-chaffer (*Melolontha vulgaris*), when every little copee, every oak, becomes animated with it and all its noisy joyful family, feeding and scrambling for the insect food. The power or faculty, be it by the scent or by other means, that rooks possess of discovering their food, is very remarkable. I have often observed them alight on a pasture of uniform verdure, and exhibiting no sensible appearance of withering or decay, and immediately commence stocking up the ground. Upon investigating the object of their operations, I have found many heads of plantains, the little autumnal dandelions, and other plants, drawn out of the ground and scattered about, their roots having been eaten off by a grub, leaving only a crown of leaves upon the surface. This grub beneath in the earth the rooks had detected in their flight, and descended to feed on it, first pulling up the plant which concealed it, and then drawing the larvæ from their holes. By what intimation this bird had discovered its hidden food we are at a loss to conjecture; but the rook has always been supposed to scent matters with great discrimination. It is but simple justice to these often-censured birds to mention the service that they at times perform for us in our pasture lands. There is no plant that I endeavour to root out with more persistency, in these places, than the turfy hair-grass (*Aira caespitosa*). It abounds in all the colder parts of our grass lands, increasing greatly when undisturbed, and, worthless itself, overpowers its more valuable neighbours. The larger turfs we pretty well get rid of; but multitudes of small roots are so interwoven with the pasture herbage, that we cannot separate them without injury; and these our persevering rooks stock up for us in such quantities, that in some seasons the fields are strewn with the eradicated plants. The whole so torn up does not exclusively prove to be the hair-grass, but infinitely the larger portion consists of this injurious plant. The object of the

bird in performing this service for us, is to obtain the larvæ of several species of insects, underground feeders, that prey on the roots, as Lianseus long ago observed on the subject, of the little nard grass (*Nardus stricta*). This benefit is partly a joint operation: the grub eats the root, but not often so effectually as to destroy the plant, which easily roots itself anew; but the rook finishes the affair, by pulling it up to get at the larvæ, and thus prevents all vegetation; nor do I believe, that the bird ever removes a specimen that has not already been eaten or commenced upon by the caterpillar. The rook entices its young from the breeding trees as soon as they can flutter to any other. These young, for a few evenings after their flight, will return with their parents, and roost where they were bred; but they soon quit their abode, and remain absent the whole of the summer months. As soon, however, as the heat of summer months is subdued, and the air of autumn felt, they return and visit their forsaken habitations, and some few of them even commence the repair of their shattered nests: but this meeting is very differently conducted from that in the spring; their voices have now a mellowness, approaching to musical, with little admixture of that harsh and noisy contention, so distracting at the former season, and seem more like a grave consultation upon future procedure; and, as winter approaches, they depart for some other place. The object of this meeting is unknown; nor are we aware that any other bird revisits the nest it has once forsaken. Domestic fowls, indeed, make use again of their old nests; but this is never, or only occasionally, done by birds in a wild state. The daw and rock-pigeon will build in society with their separate kindred; and the former even revisits in autumn the places it had nestled in. But such situations as these birds require, the ruined castle, abbey, or church-tower, ledge in the rock, &c. are not universally found, and are apparently occupied from necessity. The rooks appear to associate from preference to society, as trees are common every where; but what motive they can have in view in lingering thus for a few autumnal mornings, and counselling with each other around their abandoned and now useless nests, which before the return of spring are generally beaten from the trees, is by no means manifest to us. The hardy rook is probably not found in such numbers as formerly, its haunts having been destroyed or disturbed by the felling of trees, in consequence of the increased value of timber, and the changes in our manners and ideas. Rooks love to build near the habitation of man; but their delight, the long avenue, to caw as it were in perspective from end to end, is no longer in fashion: and the poor birds have been dispersed to settle on single distant trees, or in the copse, and are captured and persecuted.

" Old-fashioned halls, dull aunts, and creaking rooks,"

a modern Zephalinda would scarcely find now to anticipate with dread. In many counties very few rookeries remain, where once they were considered as a necessary appendage, and regularly pointed out the abbey, the hall, the court-house, and the grange.—*Journal of a Naturalist*.

4. On the substitution of Iron for Poles in the cultivation of the Hop.—M. Denis, member of the Society of Agriculture of the Vosges, has published a treatise on the cultivation of the hop; in which, founding upon his own ex-

pariance, he recommends the substitution of iron wires for poles for the training of the plant. These wires, formed in pieces of about three feet in length, and joined together so as to resemble a surveyor's chain, are suspended horizontally between two posts of oak, placed at the extremities of the lines of hops, and supported by wooden props at regular intervals. The hops are planted at the distance from each other of eight feet, and are each left with four shoots, which are conducted by little rods to the iron chain, along which they are trained, two in each direction. M. Denis computes that by this practice about a fifth part of the original cost of poles is saved, and 50 francs per annum afterwards for each 500 square mètres.—*Bulletin des Sciences Agricoles.*

5. *Consumption of Food in a German City.*—The city of Bremen, which contains about 44,000 inhabitants, consumed in 1827, 2295 oxen, 767 cows, 12,301 calves, 8,465 sheep, 6,075 hogs, 90,606 pounds of smoked and salted meat, 63,328 fowls, ducks and pigeons, 16,434 hares, turkeys and geese, 194,050 oysters, 1,133,943 pounds of butter, 56,640 pounds of cheese, 991 lasts of rye, 116,400 pounds of rye-flour, 597,850 pounds of wheat-flour, and 192,875 pounds of oatmeal. The manufacture of beer has consumed 42,999 bushels of malt, and 977 lasts of rye. There have been drunk 2,314 exhofts of wine, and 323 of brandy, rum, and arrack.—*Ephem. Geogr. de Weimar.*

6. *Advantage of Short Stages in Drawing Heavy Loads.*—Mr Stuart Menzies of Closeburn, proprietor of one of the richest coal-fields in the island, both as to quantity and quality, has very successfully employed horse power to the drawing of heavy loads, by dividing the road into short stages. Before this expedient was resorted to, each horse could travel the distance of only 18 miles, and return with a load of 24 cwt. thrice a week; that is to say, the aggregate of the labour of each horse amounted to 3 tons 12 cwt. weekly. But by dividing that distance into four stages of 4½ miles each, four horses can make three trips daily, and draw a load of 33 cwt. each trip, or very nearly 5 tons daily, or 30 tons weekly. Hence, according to this method, the aggregate of the labour of each horse amounts to above 7 tons weekly. Suppose 16 horses are employed, instead of making them travel 18 miles one day, and return with a load the following, the more advantageous plan is to arrange them in four divisions, and make each division travel only 4½ miles in succession. Were this distance divided into six stages, the load might be proportionally increased, with less fatigue to the horses; for it will invariably be found, that the most profitable mode of applying the labour of horses is to vary their muscular action, and revive its tone by short and frequent intervals of repose.

7. *On Oleaginous Plants.*—Among the articles of vegetable food, the oils which are extracted from plants afford one of the most valuable; nor are they of less importance in affording us light by their combustion. They are employed also in a number of manufactures, such as soap, woollens, varnishes, and perfumery. There are two kinds of vegetable oil, distinguished by the name of fixed and volatile. The latter may be extracted from almost every plant; but it is used only as a perfume or to flavour liqueurs, such as the oil called Attar of Roses. These sweet-scented oils constitute the luxury of the

sense of smelling, but are frequently prejudicial, from their effect on the nerves; and some few of them are employed medicinally. But the essential or volatile oils are not these most deserving our attention; the fixed oils are of much higher importance, and are extracted from a class of plants, hence called oleaginous. The oil is expressed from the seed of all these plants excepting the olive, in which it is obtained from the pericarp. The greater part of the seeds of oleaginous plants contain albumen, and it is from this that the oil is obtained; but when the seed has no albumen, as is the case with the poppy, it is the embryo which furnishes the oil. In the family of the *Euphorbiaceae*, all of which have oleaginous seeds, the embryo is of a venomous nature, and oil extracted from it would be poisonous; while that expressed from the albumen of the same plant, situated contiguous to the embryo, is perfectly innocent. Such is Bancul-nut (*Aleurites Moluccanum*), which is remarkably mild, and is eaten by the inhabitants of the Molucca Isles, as we eat hedge-nuts in Europe, while oil obtained from the embryo is an acrid poison. The fixed oils obtained by cultivation may be ranged under three heads: 1st, Olive-oil, the produce of warm climates; 2d, Nut-oil, that of temperate climates; and, 3d, Oils obtained from the seeds of oleaginous herbs. The olive-tree originally came from Syria. That plant, as well as the vine, was brought to Marseilles by the Phocians; and, at the present day, it is cultivated in all the shores of the Mediterranean. It is a tree of very slow growth, but of long duration; it can support a temperature as low as eight or ten degrees of Fahrenheit, provided the air be dry; but, if accompanied with humidity, one or two degrees below the freezing point, proves fatal.

The cultivation of oleaginous herbs enters into the course of cropping; they exhaust the soil almost as much as grain, on account of the number of seeds to be ripened; they require, therefore, a considerable quantity of manure. These herbs are generally of the cruciform family, containing azote, an element of the animal kingdom which forms excellent manure; so that, after the soil is expressed, the cake which remains serves to restore the exhausted soil. Rape is a species of cabbage with thin roots, whose seeds yield excellent oil. The poppy is an oleaginous plant, with white, scarlet, and violet flowers, while the seeds are white or black. They yield oil, perfectly innoxious and wholesome, though drawn from the same plant which supplies us with opium. Flax also is an oleaginous herb. It is, however, chiefly cultivated for its stalks, from which linen thread is fabricated; but its seed also yields the oil we call linseed-oil. It is much used in the art of painting. Hemp is of the same description. There are some few oleaginous herbs of the leguminous family, such as the subterranean arachis (*Arachis hypogaea*), a plant we derive from America, which has the singular property of ripening its seeds under ground. This plant requires a loose sandy soil, in order that the lower branches may be enabled to bury themselves in the ground. In a state of cultivation, the earth should be heaped over them, as is done with potatoes. The upper branches, which blossom in the air, ripen no seed; while the lower lateral branches, which burrow in the earth, develope no regular blossom; that is to say, have no petals; but the stamens and pistils bring the seeds to perfection.—*Conversations on Vegetable Physiology.*

QUARTERLY AGRICULTURAL REPORT.

January 15. 1830.

NOTWITHSTANDING the presumed deficiency of the crop of last year, an unusual degree of depression has prevailed in the corn market during the last three months, nor are there yet any symptoms of improvement, either in demand or price. Various circumstances may be supposed to operate in keeping the market in its present state. The difficulties of the farmers, particularly in the southern and midland counties of England, oblige them to thrash out their corn more liberally than usual; and the markets are, consequently, very fully supplied, while the raw condition of the grain prevents the speculator from storing with safety; and this, added to the circumstance of the poorer classes being unable, from the low rate of wages, to acquire sufficient means to meet their ordinary consumption, may account, in a great degree, for the depression which exists. If, however, we are correct in our opinion—and we have not seen the least reason to distrust it—as to the deficiency of last crop, we conceive it probable that, as the season advances the supplies will fall off, and that when the deficiency shall have been felt, an improvement will take place in the price of all kinds of corn. Should the condition of the grain improve, the present low prices may perhaps promote speculation in the course of spring, and thus also affect the value of corn. The stocks of old wheat have certainly not been lower for many years, and we think it scarcely possible that we shall be able to meet the consumption without the assistance of foreign supplies, although, from the present state of the averages, and the low qualities of the new wheats, the duties will probably act as a prohibition against importation until the season is far advanced.

During the months of September and October, the markets for lean stock were exceedingly dull. Latterly, the demand has been rather greater, and the prices a little higher. For fat stock there has been an extremely languid demand. Stock, it may be said, has been fully as unprofitable to the farmer as corn. In many cases he will be unable, after his summer's grazing, to obtain the price which he paid in spring. The demand for wool has in no degree increased.

This statement shows that we are yet unable to report any alleviation of that distress in which the agricultural interests of the country are involved. As regards the degree of the distress, indeed, a remark-

able distinction exists between different parts of the kingdom. In Scotland, embarrassment has doubtless been experienced, such as will never fail to be felt in any trade when a falling market occurs, and some districts, where the rents were very high, have suffered from local causes; but that any thing approaching to that destruction of farming capital has taken place in Scotland, which is represented as having occurred in the largest and finest districts of England, does in no degree accord with our observation, or with the fact. Soon after the termination of the war the rents of land in Scotland very generally fell from about 25 to 30 per cent; and, at this rate of reduction, rents have continued to be pretty steady ever since; and at the present time few farms are brought to market without exciting competition on these terms. In England, however, if we are to credit the concurrent testimony of respectable individuals from every part, matters are in a greatly more gloomy condition, and a rapid wasting of the capital stock of farmers is going on. Amongst other circumstances, these two may perhaps be stated as conducing to this difference in the condition of the two parts of the kingdom: 1st, In England, particularly in the south of England, crops have been much more defective for these last two years than in Scotland, and consequently the pressure of the low prices has been more severely felt; 2d, The burdens falling upon the English farmer, at all times greater than those falling upon the Scottish farmer, bear a larger ratio to the gross produce, and consequently are more felt when a fall occurs in the value of that produce; and not only so, but one great part of these burdens, namely, the poor's-rates, increases in actual amount, while the real means of the farmers to pay are diminished. The tithe, too, at all times an odious tax, becomes peculiarly grievous upon a fall in the value of produce, and that whether the tithe shall be commuted into a fixed payment in money, or levied in kind. Attention to circumstances thus partially operating, and affecting the part of the kingdom understood to be the most favoured by nature, and the most wealthy, may perhaps lead to some correcter views of the causes, of a part, at least, of the present distresses of the agriculturists in England, than many of those doctrines and systems of which we hear so much,—each with its corresponding remedy, put forth by its supporters as a panacea for the complicated evils of which we complain.

Some will have it that excessive taxation is the cause of all the suffering of the landed classes; and yet it is certain that all this suffering has arisen since taxation was reduced. Taxation is doubtless an evil, and a great one; but it does not appear that it is now the immediate cause of

that lowness in the price of raw produce, of which the agriculturists complain. On the contrary, the State having ceased to become the great buyer and consumer, a powerful means of enhancing the price of commodities has ceased with the lowering of taxes. Some will have it that we can only be saved by a repeal of the Malt and Beer Duties,—an opinion which we trust has been sufficiently disposed of in our preceding pages : The same individuals, however, would resort to a permanent system for the entire exclusion of foreign corn, except at the prices of a famine ; thus, with wonderful consistency, proposing to relieve our famishing artisans, by giving them cheap porter with the one hand, and dear bread with the other. Others will have it that we owe all our misfortunes to what it somewhat erroneously termed Free Trade ; and yet, if we shall look abroad to other countries, where the reverse of a system of freedom of trade has been acted upon, we shall find a distress complained of at least equal to our own, and apparently as far removed from the operation of a practical remedy. In France, the ministers of the Bourbon family have not only not relaxed, as we have done, the severities of the old mercantile system, but have so overloaded with protection, under the form of prohibitions and restrictions, their various branches of manufacture and domestic trade, that they seem to have gone far to annihilate the foreign commerce of their country altogether ; while the landlords and farmers raise the cry that they cannot find a sale for their productions. The politicians on the other side of the Atlantic, again, with their tariffs and prohibitions, have not been more fortunate ; and, with all their boasted freedom from taxation, distress so far pervades the community, that no English farmer possessing capital would be contented with the wretched return which it yields on any farm from the Atlantic to the Mississippi. Others amongst us maintain, that all our misfortunes flow from the state of the Currency, and propose remedies for the evil which are sufficiently startling. We do not deny the evil that resulted to the community from the restoration of the ancient standard by the act 1819, nor the embarrassment—temporary, we believe—that has resulted from the silly measure of 1826 ; but we do gravely question, whether another change in the standard would be just or wise, with a view to meet the evils of the present time.

Had the money standard been altered on the termination of the bank restriction act, the measure would have been submitted to without a murmur, and would have been regarded generally as an act of necessity and public justice. Were it attempted now, in a period of perfect peace, it would be regarded as nothing less than an act of national bankruptcy and fraud. One wrong, we should keep in mind, is but ill

redressed by committing another. Our legislators, when they restored the standard, by the act of 1819, ought to have considered that, for nearly the fifth part of a century before, the dealings of men had borne reference to money of a different value; and that, in money of this value, a vast public debt had been contracted. It was not an act of public or of private justice to make the debtor pay more than he owed, by raising the value of money in 1819: So neither would it be an act of public or private justice, to make the creditor receive less than he has lent, by lowering the value of money in 1830.

Into the question, however, of mere political expediency, as regards *another* change in the value of money, we do not propose to enter. This project, we apprehend, like several others, will meet with little support from the sober sense of the country; and those who have proposed it, have not yet shown themselves well qualified, if we must judge by their harangues and writings, to solve the difficult political problem of, how the country is to be freed from its present embarrassments. It is possible that this problem may baffle the wisest, and be only resolved in the end by time and the progress of events. It were hard, in the mean while, to believe, that the prosperity of England, having reached its limits, is now about to decline. If we can only believe, that the resources of this great agricultural and commercial country are not exhausted, that public industry languishes, but is not destroyed, we may well entertain the hope, that the present period of depression will be followed by that reaction, which at other times has been seen to follow a period of depression and difficulty. In the general condition of the country, as evinced by the state of its great foreign trade, its capital ready to overflow in loans to every country, and its wonderful powers of production,—we think, that if we cannot see the certainty of a return of better times, we can see, at least, no reason for despair. That the want of means to consume, on the part of the labouring population, is at least a proximate cause of the depression in the price of the necessaries of life, can scarcely, we think, be questioned. Could we suppose our artisans and labourers to be better employed and better paid; it cannot be doubted, that the effect upon the value of the produce of the soil would be immediate and direct. Perhaps, then, it is to the better employment of our vast manufacturing population, that we are to look for the means of prosperity. We have here, at least, a more rational ground of hope, than in the many crude schemes which are pressed upon our notice. The meeting of Parliament will be looked to with some interest, not because any sudden effect from legislation, however well directed, can be expected, but because questions of great moment, as affecting various branches of domestic industry, must necessarily form the subject of deliberation.

TABLES of the Average Prices of the different kinds of GRAIN, per Imperial Quarter, and of BUTCHER MEAT, sold at the following Markets, from 1st October to 31st December 1839.

LONDON.							HADDINGTON.						
Date.	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.	Date.	Wheat.	Barley.	Oats.	Peas.	Beans.	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.		s. d.	s. d.	s. d.	s. d.	s. d.	
Oct. 5.	65 5	37 10	25 0	33 6	37 6	41 2	Oct. 2.	63 1	34 11	24 13	33 2	38 9	
12.	63 1	36 3	24 0	32 2	39 2	42 4	8.	63 8	34 7	24 5	33 0	37 6	
19.	62 6	36 8	23 5	34 2	38 6	40 6	16.	62 1	33 9	24 9	33 9	35 0	
26.	60 10	34 10	24 0	33 0	38 6	39 0	23.	62 10	30 10	24 6	34 3	37 2	
Nov. 2.	57 8	33 3	23 10	31 0	38 6	37 0	30.	59 1	31 5	23 1	31 11	32 4	
9.	57 4	34 6	23 10	33 0	37 6	36 6	Nov. 6.	56 7	28 11	22 6	30 5	34 2	
16.	57 6	34 0	23 6	32 6	37 6	36 0	13.	53 8	29 6	22 0	30 5	33 0	
23.	59 2	33 6	23 8	32 6	37 10	36 6	20.	52 11	28 11	21 4	27 5	30 10	
30.	59 6	32 9	23 9	32 6	37 6	36 0	27.	53 8	27 5	22 8	27 7	28 4	
Dec. 7.	60 8	31 10	23 0	33 6	38 6	36 0	Dec. 4.	51 11	29 0	21 2	26 11	28 1	
14.	61 4	30 4	23 0	32 0	39 0	35 0	11.	53 4	30 0	21 8	27 0	28 1	
21.	62 6	31 2	23 4	31 0	37 6	35 0	18.	53 1	30 5	22 2	27 3	28 5	
28.	61 2	31 4	23 0	32 0	37 6	34 0	25.	51 4	29 3	21 6	27 5	28 9	

LIVERPOOL.							EDINBURGH.						
Date.	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.	Date.	Wheat.	Barley.	Oats.	Peas.	Beans.	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.		s. d.	s. d.	s. d.	s. d.	s. d.	
Oct. 6.	59 1	31 7	22 7	33 0	36 2	38 0	Oct. 7.	62 11	35 5	24 8	39 6	38 9	
13.	58 1	30 8	22 11	32 0	37 0	39 6	14.	64 2	35 1	24 5	38 0	37 9	
20.	57 6	31 10	22 7	30 2	36 8	38 8	21.	63 12	33 6	25 2	36 6	36 2	
27.	54 8	32 10	21 6	32 0	38 0	38 6	28.	61 6	31 8	24 10	35 4	38 0	
Nov. 3.	53 6	34 4	21 8	30 2	37 10	36 0	Nov. 4.	59 4	32 6	24 2	32 6	34 6	
10.	57 6	33 3	23 2	31 2	38 6	37 0	11.	57 7	30 6	23 4	31 6	35 6	
17.	53 9	37 9	21 6	32 2	37 2	36 0	18.	55 9	29 8	23 0	30 6	33 6	
24.	54 4	35 3	21 6	31 10	37 0	36 0	25.	56 11	29 2	23 8	30 2	33 2	
Dec. 1.	55 10	35 4	21 8	32 0	37 6	35 2	Dec. 2.	55 6	28 6	22 2	29 6	30 2	
8.	55 4	29 9	21 7	30 6	38 0	34 6	9.	57 2	30 4	22 4	28 0	29 10	
15.	57 8	37 6	29 4	30 0	37 2	34 0	16.	56 8	30 8	22 8	30 2	30 8	
22.	57 4	32 7	22 4	31 0	36 9	33 2	23.	53 6	30 4	23 6	30 8	31 6	
29.	56 8	31 6	22 4	31 6	35 6	32 0	30.	53 3	30 7	22 9	29 9	30 2	

AVERAGE PRICES OF GRAIN AS SOLD IN THE MARITIME DISTRICTS.

	Wheat.		Barley.		Oats.		Rye.		Peas.		Beans.	
Date.	Quarters.	Price.	Quarters.	Price.	Quarters.	Price.	Quarters.	Price.	Quarters.	Price.	Quarters.	Price.
Oct. 2.	78,339	60/	15,793	35/2	55,214	23/2	685	33/5	2,336	37/7	4,277	41/1
9.	73,583	59/4	26,223	34/8	40,269	22/9	638	31/10	3,216	38/2	3,774	42/2
16.	64,661	58/3	31,563	33/2	45,257	22/3	338	33/11	2,861	38/2	4,772	40/3
23.	64,437	56/4	33,667	31/9	50,556	22/2	337	32/9	3,066	38/5	6,250	38/10
30.	58,302	55/7	42,342	31/	39,740	22/1	325	30/8	2,753	38/2	5,660	36/6
Nov. 6.	65,186	56/4	47,254	31/7	42,526	22/4	317	32/9	3,324	37/5	6,196	36/3
13.	68,379	57/1	60,551	31/10	37,740	21/11	333	32/2	2,863	37/8	7,034	36/6
20.	61,071	55/4	33,783	31/4	44,500	21/9	390	30/10	3,227	38/7	5,146	37/7
27.	74,437	56/10	59,986	30/8	46,390	21/9	263	32/3	2,847	38/1	6,577	35/8
Dec. 4.	69,427	57/2	71,649	30/2	39,929	21/7	207	31/10	4,333	39/	6,976	34/11
11.	74,570	57/2	76,755	29/11	35,479	21/7	384	30/7	3,704	37/5	7,375	34/10
18.	77,134	57/3	80,624	29/6	35,929	21/4	265	32/	4,138	37/5	7,938	33/10
25.	76,405	56/5	84,074	29/6	45,466	21/4	343	33,3	3,592	36/6	6,362	32/7

PRICES OF BUTCHER MEAT.

	SMITHFIELD, Per Stone of 14 lb.		MORPETH, Per Stone of 14 lb.		EDINBURGH, Per Stone of 14 lb.		GLASGOW, Per Stone of 14 lb.	
Date.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
Oct.	4/6 @ 6/9	5/3 @ 7/3	4/6 @ 5/8	4/6 @ 5/6	5/3 @ 6/6	5/6 @ 6/6	5/6 @ 6/9	5/6 @ 6/3
Nov.	4/6 7/	5/3 7/9	4/6 5/6	4/3 5/	5/6 5/9	5/3 5/	5/3 6/6	5/ 6/
Dec.	4/6 8/3	4/9 8/	5/ 6/3	4/9 6/	5/ 6/6	5/ 5/9	5/9 6/9	5/6 6/6

*TABLE of the Average Prices of GRAIN in the DUBLIN MARKET,
from 1st October to 31th December 1829.*

Date.	Wheat Per Boll of 280 lb.	Barley Per Boll of 224 lb.	Bear Per Boll of 224 lb.	Oats Per Boll of 196 lb.	Oat Meal Per Cwt. of 112 lb.	Flour Per Cwt. of 112 lb.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Oct. 2.	23 6	17 2	12 8	12 6	14 1	20 2
9.	22 6	16 8	12 10	12 3	13 8	19 10
16.	30 2	16 6	12 6	12 2	12 10	18 10
23.	29 10	16 3	13 2	11 10	12 6	18 6
30.	26 7	15 6	12 8	11 6	12 2	18 3
Nov. 6.	28 2	14 6	12 8	10 8	12 0	18 1
13.	27 6	13 6	12 6	10 3	11 10	17 7
20.	28 7	13 5	12 6	10 6	12 3	18 2
27.	29 2	13 11	12 6	10 8	12 11	18 10
Dec. 4.	29 0	13 8	12 8	10 6	12 6	18 8
11.	28 7	13 2	13 2	10 6	12 2	18 5
18.	27 7	14 1	13 1	10 6	11 7	18 7
25.	27 7	14 3	13 0	10 8	12 2	18 8

PRICES of English and Scotch WOOL.

ENGLISH, per 16 lb.—*Merino*, Washed, 12/ @ 16/6; in Grease, 7/6 @ 10/6.—*South Down*, 7/ @ 10/6; *Leicester Hog*, 9/6 @ 10/6; *Ewe and Hog*, 8/ @ 10/.—*Moor*, *Ewe and Hog*, 3/ @ 4/6.

SCOTCH, per 16 lb.—*Leicester*, *Hog*, 9/ @ 10/; *Ewe and Hog*, 8/ @ 9/6.—*Chewot*, *Hog*, 6/6 @ 8/6; *Ewe*, 5/6 @ 7/6.—*Moor*, *Ewe and Hog*, 3/6 @ 4/3.

AVERAGES which regulate the Duties on FOREIGN CORN.

	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.
Per Imp. Quart.	56/11	30/3	21/7	32/2	37/8	34/8

DUTIES payable on FOREIGN CORN.

	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.
Per Imp. Quart.	30/8	16/10	15/3	21/3	14/	18/3

FOREIGN CORN MARKETS.

DURING the last three months great dulness has prevailed in the corn market in all parts of the Continent, and prices have been constantly declining. This arises in consequence of the low state of the averages in this country, occasioned by the poor condition of the grain, and the consequent prohibitory duties. We give the following account of the prices and stocks of grain in various places of the Continent, from the latest information which we have received.

HAMBURGH.—Winter has set in with unaccustomed severity, and which may be attended with much injury to the young wheats. In this neighbourhood, and through Holstein and Mecklenburgh, the agriculturists complain that the crops will suffer considerably from the ground not being covered with snow, leaving both the wheat and cole plants thus totally exposed to the inclemency of the weather. Owing to the early appearance of the frost, much ground has been left unsown, and in many places wheat has been harrowed in without ploughing. In the lower parts of Silesia the harvest has sustained considerable damage, and yielded very short, in consequence of the floods, which have, in several instances, this season, prevented the sowing of the lands; and wheat has actually been sent back again from Stettin into Silesia to supply the home consumption. In Magdeburgh, Anhalt, the Saale and the Marks, wheats must suffer in proportion, and according to the continuance of the frost. In Holstein, wheat has come up very irregularly, and the cole plants are generally stunted and backward. Offers of Magdeburgh, Saale and Anhalt, qualities of grain, to be delivered in spring, are made as follows:—

Wheat,	.	3s/	Oats,	.	10/ @ 12/
Barley,	.	16/ @ 18/	Pease,	.	22/ @ 24/
Per quarter, free on board.					

COPENHAGEN.—In this quarter wheat is generally bolder than it was last year, but fully as soft; and though of better colour, is still very faint. Owing to the wet season that was experienced here, the weight of the wheat, though heavier than last season, is not such as we have had in former years; what we have seen only averaging 58 lb. @ 59 lb., and but few parcels will reach 60 lb. The quantity of wheat which will be spared for exportation is estimated at about 240,000 barrels, or about 114,000 quarters, as the unfavourable weather has not affected the quantity.

Rye, from the seed time till harvest, has suffered severely by the weather, and the produce may be estimated at one-third less than usual, and much has been spoiled and sprouted. In place of being able to export any rye, Denmark will require foreign supplies, the consumption there being very great.

Barley, the chief article of export, is of bold grain, but the colour is by no means fine, being dark, and but ill suited for the maltster. Some samples weigh 52 lb., but this is by no means the general weight, the average pro-

bably not exceeding 50 lb. The quantity likely to be spared for exportation is taken at 750,000 barrels, or about 350,000 quarters.

Of oats the crop is abundant, which may be, in some measure, attributed to many fields having been sown with oats after the rye had failed in the spring. The colour is but middling, and the average weight not above 35 @ 36 lb. It is estimated that about 650,000 barrels may be spared for exportation.

The corn, when shipped in spring, owing to the wet summer, will be very liable to become heated, and it will require the utmost care to select parcels fit for shipment.

NEUSTADT.—Farmers being obliged to sell their stocks for want of money, prices of all kinds of grain are low here, and the trade has been extremely inactive, with the exception of barley, which has been freely taken for Dutch account. The quotations are as follows:

Wheat,	.	27/ @ 28/	Oats,	.	10/ @ 10/6
Barley,	.	11/ @ 11/6	Pease,	.	18/ @ 20/

Per quarter, free on board.

DANZIG.—Several samples of wheat from the interior and from Poland have been received, and the following opinion is formed of the crop: The weather has been so changeable, that a variety of qualities may be expected. That from the hills is generally of a very good quality, but that from the low countries having grown very fast, and having been pressed down by the heavy rains before it was ripe, is very thin and glassy, in some instances, quite like the Odessa wheat. These remarks apply to the wheat up to Warsaw. From Sendomir the samples are of excellent quality, and contracts are expected to be made at 35s. free on on board, delivered in spring.

Rye is heavy and good, as well as barley. Oats come to market in soft condition, but of good colour.

Sickness being prevalent in this and the adjoining countries, in consequence of the inundations in spring, the number of hands occupied in the fields and in thrashing are very limited, and, in consequence, little new grain has been brought down. The stock here of wheat is reduced to about 5000 lasts, of which very little is left fit for shipment. Quotations are as follows:

Wheat,	.	30/ @ 48/	Oats,	.	9/ @ 10/
Rye,	.	14/ @ 18/	Pease,	.	14/ @ 18/
Barley,	.	12/ @ 15/			

Per quarter, free on board.

TO CORRESPONDENTS.

We regret that the extent of our matter in the present Number, has obliged us to delay the insertion of several interesting communications,—amongst the rest the continuation of the essay upon the Agriculture of the Romans.

PRIZE ESSAYS AND TRANSACTIONS
OF
THE HIGHLAND SOCIETY OF SCOTLAND.

VOL. VIII.

(H)

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THE
QUARTERLY
JOURNAL OF AGRICULTURE.

ON THE HABITS OF THE DOMESTIC RAT, AND ON A METHOD OF
DESTROYING IT.

IN common language, the name Rat is applied generically to a multitude of animals belonging to the tribe of Gnawers or Glires, which are grouped by naturalists into different genera. Thus the musk rat of North America, the water rat of Europe, and the common rat which infests the houses of almost every country in the globe, belong each to a distinct genus. We have here to speak only of two species belonging to one of these genera, the Brown Rat, and the Black Rat. The former is the *Mus decumanus* of Gmelin, the latter the *Mus Rattus* of Linnaeus. To the same genus belongs the common or domestic mouse, *Mus musculus*, the only species known to the ancients. The principal characters by which the Rat genus is separated from the others are derived from the teeth, which are sixteen. The size is generally small, although some species, the *Mus giganteus*, *Mus sumatrensis*, and *Mus javanicus* of India and its islands, are of nearly the size of a pole-cat.

The *Black Rat* (*Mus Rattus* of naturalists, *Rat noir* of the French) is about seven inches long, from the nose to the termination of the body, with a tail of about the same length. The colour is a dull brownish-grey, intermixed with blackish hairs on the upper part, paler beneath, with the fore part of the feet whitish. It is omnivorous, feeding upon roots, seeds, fruit, the flesh of other animals, bread, tallow; in short whatever affords

sustenance to animal life. It even mutilates and devours its own species, a circumstance of rare occurrence in nature, but of which man himself presents an example. It frequents houses, and especially corn-yards, granaries, sewers and places where offal may be procured, as well as shipping, which last circumstance has been the cause of its general distribution. It is very prolific, producing several litters in the year. Its principal enemies are man, the domestic cat, the brown rat, the pole-cat, the weasel, and in warm countries large snakes. The weasel is said to be a much more formidable enemy to it than the cat, as from its small size, it is able to enter its holes, and, seizing it by the throat, keeps its hold, sucking the blood at the same time, until the rat expires. Dogs are also very keen in pursuit of this and the other species. It is distributed over all parts of the world, excepting the frozen regions of the north and south, and the deserts and sparsely populated regions of the interior. There is much doubt respecting its origin, some supposing it to be a native of the temperate parts of Europe, others thinking it to have been introduced from America. In this country it is now of comparatively rare occurrence, being almost entirely banished from the coasts by the brown rat. In some inland districts, however, it is still the only species.

The *Brown Rat* (*Mus decumanus*, *Sermadot* of the French), is superior in size to the black rat, being sometimes ten inches long in the body, with a tail of about the same length. The general colour is reddish-brown, intermixed with darker hairs, the under parts and feet pale grey. Its food and habits are similar to those of the black rat, than which it is even more destructive. Although its feet are not webbed, it swims with ease, and is thus enabled to cross rivers, and pass from one island to another. Its capability of adapting itself to circumstances is remarkable in the highest degree, there being hardly any part of the globe in which it is not able to find sustenance. In many of our own islands, it lives entirely upon shell-fish and crabs. It is a native of India, and was introduced into Europe about the middle of the seventeenth century, since which time it has increased in an amazing degree, especially in sea-ports and towns not distant from the coast, from which it has banished the black rat, which in its time was equally abundant there. It

produces several litters, of from six to ten young, in the course of the year. The young are naked, and for some days blind, as is the case with the other species. An animal so destructive, infesting houses, stores, and ships, could not fail to draw upon itself the detestation of man; but notwithstanding his destructive ingenuity, the rat, aided by its rapidity of propagation, and its natural cunning and sagacity, has been enabled, not merely to hold its ground, but to live at his expense in comparative security. Its natural enemies are the same as those of the preceding species. The terrier exhibits the most inveterate animosity towards it, as does the cat, which however occasionally finds considerable difficulty in mastering the larger individuals.

When the great annoyance and loss which this mischievous little animal occasions are considered, any mode that can be devised for getting rid of so serious an evil, becomes important. Numerous methods have been proposed, and are practised for this purpose; but we doubt if any has proved more efficacious than that recommended about twenty years ago, in a work entitled "*A Disclosure of the Method of Rat-catching, as practised by Benjamin Broad of Thruxton, Farmer.*" It was published at Hereford in the year 1818, and is now scarce, and difficult to be got. It so perfectly answers the end it proposes, that we shall make no apology for introducing it to the attention of the reader. The means it presents are completely within the attainment of any one who will bestow the attention requisite; which attention solely consists in an implicit compliance with a number of minute directions, trifling in themselves, but all absolutely necessary to deceive the vigilance of a most wary and sagacious animal. The instinct of this little creature is quite surprising, and almost persuades one that, in defence of its existence, nature, in addition to its wonderful fecundity, has given it a degree of cunning approaching to the faculty of reason.

Our attention was first directed to this pamphlet from some partial accounts that we had heard of its author, and which we shall mention, without, however, vouching for their accuracy. We understood that a farmer in Herefordshire possessed a command over the rat by some secret charm, insomuch that he could fascinate them, and make them subservient to his will; and that

his fame having reached the Admiralty, the Commissioners of that Board had offered him a large premium to impart his secret, provided his art surpassed that of the professional rat-catchers whom they had in their employ. Two ships swarming with rats having come into dock, it was thought a good opportunity of trying the respective merits of our author and his professional rivals. A great deal of skill was shown on both sides, and each party declared their respective ships quite cleaned. Our author, however, on examining the ship of his opponents, declared there were still rats in her, which was acknowledged by the professional gentlemen; but they were some old cunning rogues whose capture was far beyond the skill of any rat-catcher in existence, and they were certain there were some of the same kind lurking in the ship that our author had had confided to him. But this on his side was denied, and he defied them to catch a single rat in his ship, while he volunteered to make the ship that they had failed in as clean as the other. The result proved his superiority, for the professional rat-catchers were completely unsuccessful in the ship he had cleaned, while he caught several in the ship they had under their care. Envy exists as powerfully in the breasts of rat-catchers as in the breasts of authors; and it was alleged by the unsuccessful party that he had turned these rats loose in the ship after stupifying them for the purpose of being caught. But our author's superiority was again evinced, for he desired these identical rats (which had been preserved) to be marked in some way unknown to him, and turned again loose into the ship, and then challenged his opponents to retake them. This they tried to do, but were only partially successful, and our author had the ingenuity again to capture the remainder. From some circumstance, however, which we have not learned, the Commissioners of Admiralty appear not to have considered his secret worth the price he had demanded. The anecdote that follows we ourselves can vouch for, as it came under our own knowledge: Much about the time that these rumours of our author's skill reached us, we persuaded one of our friends who was much annoyed with rats, and who had a considerable portion in his character of what is called "*true varmint*," to give the plan recommended a fair trial. We shall give the result in his own words: "I found the

means prescribed perfectly effectual in lulling the rats into perfect security, and had almost cleared my premises when business called me from home, and I left the traps in charge of a young lad, to whom I gave such directions as I deemed necessary. But on my return he informed me that one of the traps which had a very heavy door had been interrupted by some obstacle in its descent, and had afforded time to the rat enclosed to escape, but not without leaving one of its hind feet, and part of its tail, which the fall of the door had chopped off. After this partial failure, for some time no more rats were caught, as they were shy, and although they ate the bait round the traps, they declined going into them. However, by using the same preliminary inducements as at first, the rats either forgot the warning that their comrade had evidently communicated, or the temptation of the bait was irresistible, for they again began to enter the traps; and when their confidence was once more regained, the catching recommenced, and a good number were destroyed. But it again ceased, and I should have supposed that the whole colony had been exterminated, had not some small appearances convinced me that there were still some remains. In about a week after this, during which time the traps had remained baited and set, one more rat was caught, and to my surprise he turned out to be the identical unlucky culprit who, on a former occasion, had lost his tail and one of his hind legs, but who could no longer resist the fascination of the bait. Since that time, no vestige of rats has been seen about my premises."

But we must return to the book itself. By some means, our author had discovered that a mixture of *pale* malt, with a very small portion of the oil of caraway, formed so inviting a repast for rats that they could not resist it. But the sagacity of the animal is so strong, and its sense of smelling so exquisitely acute, that the least taint of the interference of man rouses their suspicion, and prevents them from indulging their natural propensity.

This is the ground-work of our author's plan, and one of its leading requisites is, that the operator, whenever he touches the traps, must overcome the natural odour of his body, by smearing his hands with the bait that he employs; and must

never, on any account, omit this precaution when he comes in contact with the traps that he is using.

There is nothing very particular in the shape or construction of the trap that our author recommends; but as he himself speaks very particularly as to its shape and construction, it is but fair to give his own words:—

“ The first object to which the attention of the reader must be paid, is the construction of proper traps.

“ One kind only has been used by the author with success; and that alone he ventures to recommend, though it does not appear improbable that great improvement in the kind of trap may be made. His trap differs little from the common box-trap in structure; but it will be found advantageous, and indeed necessary, to attend to the dimensions and length recommended; for if it be either longer or narrower, the rats will not enter in so freely, and if it be shorter, the danger of their escape, after having entered, and of being struck by the falling doors, will be increased; and a rat which escapes after receiving a blow from a falling door, will not probably for some hours at least, approach the trap again. The length of the trap recommended is two feet, its width eight inches, and its depth nine inches, inside measure; and the wire grate, which is intended to attract the rats taken to the light, and prevent their injuring other parts of the trap with their teeth, should be four inches wide. This grate must be made of iron wire; for the old rats soon destroy either brass or copper, and the meshes of the net-work must be small enough to prevent the escape of even the smallest mouse, or these animals will sometimes be found troublesome, though they are not very strongly attracted by the compound used, nor usually, with sufficient cause, very fond of the company of their conquerors, the rats.

“ The bridge upon which the rats tread to occasion the falling of the doors, should be made of tin, or very thin iron plate, about six inches wide, and four broad, so as to extend nearly across the inside of the trap; and the neck of the bridge should be made of a light slender bar of iron about two inches and a half long, so as to extend about two-thirds of an inch beyond the external surface of the side of the trap for the purpose of setting it.

“ A thin plate of iron or tin, should be nailed upon the inside of the aperture, through which the neck of the bridge passes, or the rats will soon destroy the trap by enlarging that passage. The end of the bridge opposite to the neck must be suspended about half an inch from the bottom or floor of the trap, by a single loop of iron wire, attached to a hook fixed in the side of the traps; by which means the bridge, being very loosely suspended, will move with the slightest pressure upon either side of it, and the trap will be made to strike by the weight of a small mouse.

“ The traps hitherto used have been made of elm or birch, or poplar boards, which are without scent; and how far the strong scent of deal might prove injurious, the author cannot decide; but he wishes such wood only to be used as has already proved eligible. Whatever boards are chosen should be well seasoned, or they will be subject to warp, and the doors in consequence will not fall perfectly.

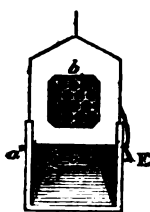


Fig. 2

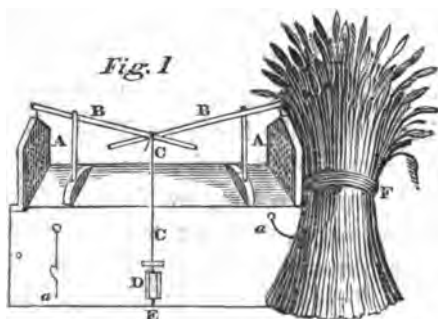


Fig. 1. in the preceding sketch represents the trap when set.

AA are the falling doors, with the wire grates.

BB, the levers which support the doors.

CC, the small cord which is attached to the trigger.

D, the trigger. A small thin plate of iron, two inches long, and about six lines broad, with a hole in the middle to receive the cord which passes the levers.

E, the extremity of the neck of the bridge.

F, a bundle of straw placed to conceal the entrance of the trap. There should be two or three such as this put at each end.

a, the pin which holds up the door.

Fig 2. This section of the trap gives its appearance end-ways, and is intended to show the position of the door, bridge, trigger, &c., as when set for catching, except that the pin is in its acting state, and the bridge must be covered with straw, agreeably to the directions herein after given.

E, the end of the neck of the bridge, projecting two-thirds, or not more than three-quarters of an inch.

a, the pin which supports the door.

b, the wire grate or window.

c, the bridge hanging horizontally half-an-inch above the floor.

“ In setting the traps, care must be taken that the triggers have not too deep or strong hold of the neck of the bridge ; and to prevent the probability of this happening, the depth of the notches in the neck of the bridge should not be more than what will be necessary to cause the bridge to be supported till the rats tread upon it. The trigger should also stand very nearly perpendicularly, as the weight of the rat will then operate most powerfully to disengage it from the neck of the bridge. (Fig 2. E.)

“ When the traps are set, the falling doors must be raised six inches from the floor ; for if not raised so high, the rats will be sometimes found cautious in entering them ; and the doors must be made to hang evenly (by slightly moving the levers when necessary), so as not to press more upon one side of the grooves, through which they descend, than the other, as they may not always fall with sufficient quickness.

“ The traps being prepared, the most proper and convenient places for setting them must be found. These are either close to their holes, where every animal is least timid, or where they are known to come regularly for food, and *not* where a rat has been accidentally seen. Wherever they often pass, the boards or stones will be discoloured by their feet ; and such marks will generally indicate proper places for the traps.”

Our readers will find, if they once fairly take to the sport, that there is no amusement that will afford them more entertainment (taking it always for granted that they have a *varmint* bump on their cranium) ; indeed, this is so much the case, that

in one instance we heard a friend of ours, who is a very keen and staunch sportsman, debating most anxiously whether he would go, on the 12th August, to the moors, or stay at home and attend to his rat-traps; and we believe the moors only carried the day, by the recollection that he might enjoy the pleasure of his traps on his return.

We have found that from three to half a dozen traps are as many as most cases require. In justice to the author, we shall quote his own description of the manner of baiting them.

“ In preparing and setting the traps, the following instructions must be most closely followed, as the most trifling deviation will often destroy all chance of success. Be provided with as many ordinary trusses of *sweet clean* straw as you have traps, and take from each truss a small bundle, about as much as, when compressed in the hand, will be an inch in diameter. Then take a small vial bottle, the neck of which is about one-third of an inch wide, and which contains half an ounce of oil of caraways, invert the bottle upon the palms of your hand, and then return it to its former position, letting no more of its contents escape than that which has adhered to the hand, while the bottle has been inverted. Rub your hands then well together, and draw the straw through them, bending it so as to render it soft and flexible. Let it then be placed lengthways in the trap and laid smoothly and evenly, to cover the bridge, and every part of the floor of the trap regularly. Then take five half-pints of *good pale* malt, ground for brewing (if it be discoloured in drying, as the malt of the metropolis usually is, it will not do), place it in a large basin, invert the vial of the oil of caraways upon the palm of the hand, and take from it the quantity which adheres, as already directed, rub the hands together, so as to spread the oil of caraways regularly over them. Then take up successive portions of the malt in each hand, and subsequently with both hands, rubbing it between them, that every part of it may be equally scented. Much accuracy is here necessary; for if the quantity of the oil of caraways be too great, the rats will not touch the malt till the scent is partly gone off. The proportion of the oil of caraways to the malt appears to be about one to nine thousand.

“ Let about half a pint of the malt be thrown into each trap by the hand of the person who has prepared it, scattering it rather regularly over every part of the floor. Place the traps then in the situations where they are to remain (close to a wall will generally be the most eligible), and secure the doors from falling by placing the pin just at the height they are to stand. When the traps are set (Fig. 2. *a*) divide each truss of straw into half a dozen parcels, and put a band round each; place two or three of these at each end of every trap (Fig. 1. *F*) and sprinkle a few loose straws over each, so as in some degree to conceal the traps from the eyes of the rats. If the room contain any furniture, or trunk of any kind, let the traps be set behind it, if it stand near the holes by which the rats enter; or move the furniture that it may partially conceal the traps, not so much, however, but that the person who attends to them, may be able to see whether they have struck or not, without approaching very close to them. The morning is the most eligible time for this part of the process; and wherever the doors of the rooms in which the traps are set can, with convenience, be kept locked, it should be done.

“ The following morning the traps may be looked at, and if the rats be in any degree numerous, the whole of the malt will generally be eaten, and the scented straw be entirely taken away. These must then be prepared as before, and replaced according to the preceding directions, and the traps and trusses of straw must be left as exactly as possible in the order they were at first, for the rats are suspicious of the least innovation.

“ If the malt be not eaten on the morning after the traps are baited, nor the straw removed, let every thing remain untouched; for rats are often in the habit of changing their quarters for a short time, and returning again. They are also driven away by a pole-cat, and still oftener by the larger weasel, or stoat, being excessively afraid of this fierce and daring little animal, to which slaughter is amusement, and which rarely feeds upon the carcasses of the animals it deprives of life. Let the traps, therefore, retain their places; and if the rats have not permanently left the vicinity, (they sometimes migrate sud-

denly in large bodies), sufficient evidence of their having visited the traps will soon be obtained."

It is absolutely requisite to keep the floor of the trap constantly covered with the perfumed straw, in which the rats appear to take much pleasure; and, in fact, from this pleasure in a great degree the operator must expect to derive his means of deceiving these sagacious animals into the foolhardiness which enables him to capture them; and he *cannot* spend too much time or exertion in depriving them of their wariness. This is only accomplished by making the traps and the straw always retain a uniform appearance, by never touching the traps, or any of their accessories, except with a scented hand; and allowing them plenty of time in rioting in the free use of the bait while the traps are fixed, in no case less than three days, and in some cases more where the rats have been much harassed.

When the rats are caught, "to take the rats from the traps, a long and rather a slender bag, made of some thin material, which will admit a moderate quantity of light, must be provided; and into this the rats will be easily driven from the traps, by introducing a slender stick through the wire grate at one end of the trap, and raising the door at the other end, to which the bag is applied. During this or any other operation, the hand must not on any account be introduced into the traps, unless it be previously scented, or no farther success must be expected; even the part of the little stick which is introduced through the grate of the door ought never to be touched with an unprepared hand.

"Should the trap contain more than one rat (and it will often contain five or six, or more), and all do not enter the bag at once, it will be necessary to let down the door, and drive those that have come into the bag to the end of it, and then prevent their return, by tying a string round the bag near to the end to which they have been driven. The remainder may then be made to enter the other division of the bag, and may afterwards be admitted to their former companions; and if the string be replaced, leaving the rats confined sufficient space, all that are taken out at the same time from five or six traps may be secured in the same bag. Particular care must be taken not

to hurt them in taking them from the traps ; for their cries never fail to excite terror and mistrust to all in the vicinity, and will generally prevent any more being taken within the succeeding twenty-four hours ; it will therefore be proper to take the rats to some distance to destroy them. The greatest degree of precaution should also be used not to suffer a rat to escape after being taken, for animals have generally powers of conveying their apprehensions of danger to each other, though they do not seem at all capable of informing each other of the form or nature of the enemy or danger apprehended.

“ The traps will require to have a small quantity of prepared malt thrown into them each day ; and it will be necessary to renew the scented straw once in five or six days. It is always advantageous to take out the rats as soon as possible after the traps have struck ; and, therefore, when the rats are numerous, and have entered the traps freely, it will not be eligible to let them remain set when they are left for the night ; because few rats only can be taken by the traps during the night when they are not attended, and the remainder come more boldly into the traps the next day, if they have had full liberty to enter the traps with impunity during the preceding night, than if, during the same period, they have seen one of their companions labouring to break through the bars of his prison. But when the number remaining is small, and the destruction of a few rats comparatively important, the traps may remain set during the night ; and it will not unfrequently happen that a rat having been struck by the falling of the doors, or otherwise rendered suspicious, will not approach the trap till late at night, when all is quiet. If there be any cats about the house or buildings where it is proposed to take the rats by the preceding means, these should be previously confined or taken away ; for they will otherwise often approach, and even enter the traps ; and when one is taken, it communicates a scent to the trap, which will render it wholly useless, till it has been exposed some time to the air and rescented. Dogs should also be prevented approaching the traps, and no person, except those employed previously in baiting and setting them, should be permitted to touch them ; for animals of many kinds probably distinguish

individuals of the human species from each other by their scent and smell ; and the rats, after part of their number have disappeared, will sometimes take alarm at a stranger ; and it will on this and other accounts be desirable to select such places for the traps, wherever that is practicable, as can be secured by locks.

“ Should any particular trap be found not to take like the others, it will be proper to examine it, and make its doors fall and set again ; for the falling of the bridge will sometimes be prevented by some substance getting under it ; and it may also, where proper care has not been taken, rest upon the floor of the trap ; in which case, it cannot possibly be disengaged by the weight of the rats.”

We have always found that the best time for catching is early in the morning, as at that time, and during the day, the traps are most easily attended to ; and it is an injurious thing, and to be avoided if possible, allowing the rats to remain long in the traps before you destroy them. In some cases, however, where they have been made suspicious and shy, it is necessary, although inconvenient, to carry on the war during the night.

The book itself is written in a clear, distinct, and intelligible style, and does credit to the education of the author.

He subjoins also some rules for catching the common mouse and the long and short tailed field mouse, which are deserving of attention, and which we recommend to the notice of those who suffer from their depredations.

ON THE MANURE REQUIRED FOR A COURSE OF CROPS, AND
THE PROPORTION OF IT WHICH THE DIFFERENT SPECIES
ARE CAPABLE OF PRODUCING. *By Dr COVENTRY, Pro-
fessor of Agriculture in the University of Edinburgh.*

AGRICULTURE and the management of live stock form the principal departments of husbandry. The object of agriculture is the acquisition of such vegetable produce as will best suit the situation and purpose of the husbandman. It consists of two branches.

First, The cultivation and general management of *arable lands*, either such as are already tilled, or such as might be rendered fit for tillage, and profitably kept in common course, for a longer or shorter term, under that mode of culture : And,

Secondly, The treatment of *lands not under tillage*, with the application of their produce.

What relates to the cultivation of the former class of lands may be included under three heads. 1. The means commonly employed in the culture of arable land in general, chiefly drainage, tillage, and manuring : 2. The culture and management suited to the different species of crops respectively : And, 3. The schemes of cropping, with the order in which the different species should be raised.

It is an important subject of inquiry, how the kinds of produce best adapted for different situations, soils, and purposes, should be selected and assorted, so as to obtain, at the cheapest rate, and with the most certain success, those which are the most advantageous, and best correspond with the nature of particular possessions, and the husbandman's means of raising them, keeping in view general economy and profit, and the full supply of manure requisite to support the fertility of the soil.

The circumstance of any situation alone can determine what are the most proper species of crops for culture ; the best proportion in which the different species should be cultivated ; and the best order or succession with respect to one another, in which they should be raised. Certain particulars, also, in different cases, require the attentive consideration of husbandmen, when about to settle the mode of culture for their arable fields ; and there are some of them of general import, and others more connected with particular or separate possessions.

First, The general circumstances, or those which relate to the husbandry of the district, and which require attention in fixing a rotation or course, are,—1. The character of the climate : 2. The general nature of the soil : 3. The acquisition of manure, and particularly whether any extraneous supply of putrescent manure can be obtained : 4. The markets, as more or less distant, or as adapted for the disposal of some articles of produce more than others : 5. The kind of husbandry followed

in other parts of the cultivator's own land, or the general husbandry pursued by him, and that pursued in the district at large, so far at least as it may concern his interest or affect his own scheme: in order that the whole might form one rational, consistent, and united system of husbandry.

Secondly, Those particulars which are more connected with the management of separate possessions, and fields, are,—

1. The advantages of having, at suitable times, and of managing in a proper manner, an herbage crop, such as grass, clover, &c. The expediency and advantages of cleansing the land of weeds, either by a fallow, with the loss or with the delay of a crop, or with the substitution of one crop for another; or by a hoed crop, otherwise called a "fallow crop:"
2. The benefits which attend the raising of crops best adapted to the nature and state of the land:
3. The propriety of raising the crops most suitable to the condition of the manure:
4. The benefits that arise from causing the manurings and the cleansing process correspond in the times when they are performed, and of making the endurance of the herbage crops, and the length of the whole course, such as will suit with these operations, and accomplish this purpose:
5. The advantages of raising different species of corn and other crops, to divide the labour, and ensure more success otherwise:
6. The advantage of regularity in cropping, and in the general arrangement of labour.

The foregoing particulars being all of them more or less kept in view by the husbandman, he should next endeavour to compare different schemes of culture and cropping, in order to ascertain how far the latter agree with the rules which may be drawn from a consideration of the former. He will never be able to determine what are the most beneficial courses of crops, namely, such as enhance his own profit, and promote the improvement of the soil, till he shall understand how the peculiar advantages resulting from such courses arise, and what are the disadvantages which, in certain cases, attend them.

All schemes for the cultivation and cropping of arable land, should invariably be formed after duly considering the three leading particulars on which their relative value or preferableness chiefly, if not wholly, depends. These are the *labour* of cultivating the different species, which very much determines

their prime cost to the cultivator ; the *manure* requisite for the species composing the course ; and the quantity they are capable of affording respectively,—considerations of vast importance, as, by the proportion of it required and afforded, one is able to judge how far any particular course of cropping is capable of being supported ; and the price which the different sorts of produce bring in the market, or the return which they otherwise make to the cultivator. It is at present proposed to direct attention to the second of the particulars here referred to, namely *manure*.

What relates to the quantity of manure necessary for raising a course of crops on arable land, and the proportion which the different species are respectively capable of affording, when they are consumed on the possession, as forage or litter to live stock, or otherwise, forms an inquiry of primary consequence in every situation. Ignorance and wrong notions about this matter, have often produced serious errors in practice ; and the information concerning it found in books on agriculture, is in general scanty, and seldom correct. It is therefore an object to ascertain, as precisely as possible, what are the particulars that merit chief notice on the subject of cropping, the selection of the proper species, the most suitable proportion that should subsist among them, and the most useful and convenient order in which they should be raised. Here some general data, or admitted facts, must be assumed, before one can be in a condition to reason correctly on the subject, or be able to reduce the numerous observations that have been made on it to an useful shape, and to combine, with good or just effect, the various considerations and circumstances connected with it, so as to regulate and improve the practice.

As to the *quantity* of manure requisite, it may be sufficient to observe, that, from different accounts, it is probable that ground of a medium degree of fertility, and of a medium situation and character, as to altitude and climate, would require, per acre, about five tons of ordinary putrescent manure * for each year of

* The manure is supposed to be the putrescent mass of common "muck," or the farm-yard compost, made up of the dung and straw from the different offices, and in its ordinary state of preparation, or to be just so rotten as to spread equally over the ground for a turnip or potato crop (for it is not

the course or rotation, to support the culture and raising of a mixed and equal proportion of green herbage or fallow crops, and white or corn ones; that quantity being supplied, not in small portions annually, but in large ones, at intervals of from three to five or six years distance; that few dry, sandy, or gravelly grounds can ever require the repetitions of the manure to be nearer than three years, and 99 out of 100 cases will admit of it, with no disadvantage, to be at the distance of four or five years; and that few clayey soils, if duly dry, can beneficially want it longer than six years; that is, on a supposition that the herbage crop or grass, though it continue for more than one year, as in pasture, shall be reckoned only as one crop in the course; that the manure in the proportion stated, 20 tons every four years, or 25 every five, &c. is to be given, so far as convenient, regularly at the cleansing period, that is, when the cleansing process is nearly accomplished, to be covered in by the last ploughing in the case of a summer fallow, or when the preparatory tillage is nearly concluded for a fallow crop.

meant that it should be so much decomposed or reduced, as may be proper for corn or a grain crop), and in its ordinary state of dryness, and then the mass will generally be found to contain from two-thirds to three-fourths of its weight of moisture.

Cattle getting wholly straw or dry forage for food and litter, may consume nearly three-fifths of it as food, and there would still remain a good mixture of dung and straw for manure. When they receive, as a keeping or rearing stock, a few turnips to keep them in good condition, and free of costiveness, or when they are fattening on potatoes or oil-cake, with dry provender, such as straw, and are not loose in belly, the manure will be in best condition when they eat about one-half of the straw, and leave or have expended the other half as litter. If, again, cattle are fattening on turnips, or on distillers' wash and grains, or any other succulent food, from which they may make much urine, and have thin dung, they would require to have three-fifths, if not three-fourths, of the straw left for litter. The proportion now mentioned expended as litter, will, in these several cases, be found to afford manure of a good description. But, by occasionally moistening the heap, and turning it over, almost any quantity of straw, with a small proportion of dung, may be converted into manure, and rotted to any degree. Probably, unless in the neighbourhood of towns and such other places, where not only that article, but the whole produce of land may be disposed of, and putrescent manure purchased back in return, there are few situations in which straw could be applied with more advantage to the cultivator, than as fodder and litter to his live stock.

It may be observed, that many persons apply at times a portion of the putrescent manure to the surface of the grass land, either to sustain its productiveness, or before breaking it up by the plough; but there must always be great waste where this is done, instead of covering it in properly by a portion of the soil. If laid on a short time before the grass land is ploughed, it may be covered in too deep, or much of it may be thrown to the very bottom of the soil, with less advantage than otherwise to the crops; and if spread some months or years before tillage, much of it may be lost. In the decomposition of putrescent matter on the surface of the ground, every one must be sensible, by the smell, of the ascent of part of the materials; and no one can doubt that animal and vegetable substances, if long exposed to the atmosphere in a putrifying state, will almost entirely disappear. The loss in the manure may vary; but every hour it lies spread on the surface, it must of necessity suffer some waste. On the contrary, if ploughed in towards the end of a summer fallow, or with a horse-hoed crop, it will be most effectually blended with and covered in by the soil, and all that essential part, which becoming volatile, is dissipated into the atmosphere, will thus be retained for the nutriment of the after crops.

In computing the quantity of manure furnished by different species of crops, it may be supposed,

1. That the possession, farm, or field cultivated, is of the common sort, or such as may be met with in all ordinary arable districts; that it is, for example, of a medium degree of fertility, naturally, if one can so speak, or at least, that it shall be brought to that condition before a determinate course of cropping is adopted; or, in other words, that the land is capable, in ordinary years and under decent management, of producing, in round numbers, near 7 bolls Linlithgow measure, about 28 bushels of wheat, and 36 bushels of barley, or 42 bushels of oats per statute or imperial acre. Ground of this degree of fertility will generally be capable of bearing per acre, with tolerable culture, a crop of turnips weighing about 25 tons; a crop of potatoes, weighing 8 or 9 tons, that is, about 40 or 45 full or "heaped" Lothian bolls, (each peck being 28 lb. *avoirdupois*, and each firloft one cwt. or 112 such lb., and each boll four such cwts. and 5 bolls one ton)

and a crop of herbage, of clover and ryegrass, in a state of hay, weighing from 160 to 175 stones Scotch *tron*, or about $1\frac{1}{2}$ ton.

The weight of such white crops will generally be found (taking the average of wheat, barley, and oats,) to be from 38 to 42 cwt. or 2 tons. *Corn* may generally be calculated to be about $2\frac{1}{2}$ cwt. per boll (this is about $14\frac{1}{2}$ stones of the common Dutch "or meal" weight of $17\frac{1}{2}$ lb. to the stone) and the *straw* of the boll to be about 3 cwt., or 15 stones *tron* weight—this stone being at least 22 lb. This would give $2\frac{1}{2} \times 7$ (the number of bolls per acre) = $15\frac{1}{2}$ cwt. of corn per acre, and 3 cwt. $\times 7 = 21$ cwt. of straw per acre. This would appear to be pretty near the case in general, though there may be considerable variation in different seasons and situations. Now, supposing that straw by being moistened and rotted, will not absorb or hold such a proportion of water, and gain thereby such weight, as to be four times heavier than what it was in its dry state of straw, but only contain, when reduced to the state of manure, a little more than two-thirds, or between three-fourths and two-thirds of its gross weight of moisture, this quantity of 21 cwt. will not yield much more, even by the most careful application of it as fodder and litter, than $3\frac{1}{2}$ tons. Admitting, however, that a part of the corn is consumed on the possession in the feed of horses, &c. and supposing that the refuse of the barn, the chaff and light corn besides the straw, &c. go ultimately to the dung heap, and may be equal to the dry weight of half a boll of corn, giving near half a ton of more manure, one cannot reckon the amount of the putrescent manure, gained from an acre of such produce, at more than 4 tons; and probably it is stated rather high, when set down at that number.

If the *hay* crop weigh $1\frac{1}{2}$ ton per acre, then, when consumed, it will produce of manure, which, in a good state of dryness and preparation, will have from between two-thirds to three-fourths of its gross weight of moisture. This will give about $6\frac{2}{3}$ ths, or rather above 6 tons of manure per acre—even though the forage of the second crop or after-grass should not be reckoned on. In some cases, it is said to have turned out to be rather more, that is, a greater weight of manure was gained from a given weight of hay, consumed by live stock in a house or situation where it could all be collected; but it may be suspected that the ma-

nure had then been weighed in a very moist state. Two-thirds of moisture, or very little more, are, in most cases, a proportion nearer the truth than the average of two-thirds and three-fourths assumed above. It should be observed, that the second produce in the season of the herbage crop, whether mown or pastured, will more than compensate for what is withdrawn, by going to the nourishment of the animals, or dropt on roads occasionally in their dung.

These very general calculations tend to show that the white or corn crops are not competent, by the produce of their own straw, chaff, light grain, and what portion of the better grain is used on the possession, to yield more than 4 tons of good manure per acre; and that, on the other hand, the herbage crop is capable of affording fully 6 tons, or 50 per cent. more than the other. It is likely that a full produce of turnips, potatoes, or cabbages, &c. consumed on the possession, would furnish even a considerably greater weight of good manure, judging of that article by the like proportion of moisture in different parcels of it, as in the manure from straw, pulse, hay, or herbage of any sort.

2. It is also understood that nothing but grain, or the growth in seed, and live stock, shall be sold or sent from the possession; the whole produce of the hoed and herbage crops, the haulm of the pulse, as beans, pease, tares, or the like, and the straw of the corn-crops being used on it (no doubt after the most economical and lucrative method that the husbandman can devise or employ); in order to afford manure: And,

Lastly, it is presumed, that not more than one-half of the grounds included under the arable course of management, shall be under white corn-crops, such as wheat, barley, oats, and rye.

Should the land be of a *less* degree of fertility than now supposed, then it can only, or chiefly be farther improved, either by having introduced a larger proportion of hoed herbage, or pulse crops, or such as meliorate by supplying a larger proportion of manure, not only than what the corn crops do, but than what is wanted to preserve the subsisting degree of fertility in the soil, or else by having recourse to an extraneous supply of manure, by which is meant more putrescent manure

than what the crops raised would afford by their consumption: And, perhaps, it may be here hinted, that it is always more easy to augment the fertility of any soil in proportion as it is already fertile, or, in other words, it is more difficult to raise the fertility of land from the pitch of bearing 5 bolls to that of bearing 7, than from 7 to 9 or even 10. Accordingly, it happens that there must be variations, not perhaps in the species of corn-crops, but in the proportion of such according to the degree of the land's fertility.

Farther, were more than grain or live stock to be sent from the possession, and the degree of its fertility not to exceed the rate of 7 bolls per acre,—were, for example, potatoes and hay to any considerable amount, and for a series of years, to be sold from it, its fertility would soon be reduced; though, perhaps, the application of lime, marl, shelly sand, or any other form of calcareous manure, to *new* lands (lands to which that article, lime, is a new ingredient), may contribute, for a time, to prolong the productiveness of such. It is enough that the fact of the waste, by the disposal of such produce, that is, of the green or manure-making crops, holds good in nine out of ten cases.—Again, with no extra manure, were more of the ground under the arable course of management to be under white crop than one half, it is likewise certain, that an inferior degree of fertility would be the result; for such do not, by every account, furnish, in the climate and ordinary soils of this island, the full means of their own reproduction, or that in a degree equal to their previous amount and value.

ON THE AGRICULTURE OF THE ROMANS—*continued.*

IN a former article we had entered on the third division of our subject, that of the agricultural operations of the Romans, and had noticed those of Ploughing and Fallowing. The next that claims our attention is that of Manures.

The value of manures was duly appreciated among the ancients, and Augeas in Greece, and Mercutius in Italy, have been immortalized as the first discoverers of their utility. The care

and economy, which the Roman farmer carried into all his agricultural operations, were fully displayed in his management of manures. Every material capable of decomposition was collected, and every source almost was resorted to, which modern science or experience has suggested, whether vegetable, animal, or mineral. To prepare it properly for being laid on the fields, two dunghills were constructed on every Roman farm, one for receiving the dung as it came from the offices, whence it was carried to the other to undergo the lengthened decomposition which they thought essential. Both these dunghills were gently hollowed and paved in the bottom to prevent the moisture from escaping. They were usually built at the sides, and when full, to shelter them from the sun, they were covered with a net-work of branches and twigs. They allowed their dung, when intended for corn-crops, to lie a whole year in these dunghills, conceiving that at this period it retained its full strength, and that the seeds of weeds were all destroyed. By this long and exhausting decomposition, they must have greatly diminished the value of their manure. Some modern agriculturists differ from them so far as to maintain that it should be laid on perfectly fresh; but in this state it is found to be of little benefit to the crop which succeeds, and to be liable to the objection of which the Romans complained, that of producing weeds. The practice most usual in Britain is a medium between these, and is, perhaps, superior to either, according to which, the manure which is made in winter is laid on the fields during the ensuing summer.

The quantity of dung which they usually applied was from 18 to 24 loads on a *jugerum*; 18 commonly on level ground, and 24 on a declivity. This was at the rate of from 20 to 30 tons on an English acre, and, considering the easy culture which their land received, was abundantly liberal.

Several maxims respecting the management of manures are mentioned by their authors as current among Roman farmers, and from which it was reckoned the utmost negligence to deviate. One of these was, that "dung should be ploughed in as soon as it is spread on the field;" another, that "land becomes cold when long without manure—that it becomes parched by an excessive supply, and that it is much more beneficial to manure

it often than too heavily at a time." This was long transgressed in modern practice, and one-half of the farm was commonly rioting in excess while the other was starved. The evil of this is now seen, and experience has, in this as in many other things, conducted us back to the better practice of the Romans. It was a maxim of scarcely inferior importance in the distribution of manure, though likewise too little attended to by modern farmers, that they insisted on the husbandman, when he carried out his manure, "spreading it with accuracy, and dividing it into the smallest pieces." Some others of these maxims of experimental wisdom, though of inferior importance, were regarded as of no less authority, such as, that manure should never be laid on the fields but when the moon was decreasing, and the wind blowing from the west,—by attention to which things, it was thought the fruitfulness of the succeeding crop was remarkably increased.

It was a practice among the Greeks and Romans, when there was any deficiency of manure, to plough in certain leguminous crops when green; and this was considered one of the most enriching applications they could make to the soil. They were ploughed in when their juices were in greatest abundance, and, besides any other fertilizing effect, they would be highly beneficial in the arid seasons to which Italy is exposed, by communicating a supply of moisture to the soil. The same system has long been in operation on the continent, and has been attempted in Britain, but never with much success. It is quite adapted to the rapid vegetation of an Italian climate, and is, perhaps, the cheapest mode of manuring their fields, but is quite unsuited to the tardy growth of our northern latitudes.

Lime and marl were likewise known to the Romans as useful manures; it is mentioned by Pliny, that the Gauls applied them with success to their corn-fields; and though they do not appear to have been used for this purpose in Italy, lime was employed by the Romans to a small extent as a manure for their fruit-trees, and was thought to hasten the ripening of the fruit. They were familiar with its use in building; and the formation of the kiln, and the process of burning, are minutely described by Cato. The kiln consisted of a truncated cone, ten feet in diameter at the bottom, and three at the top, with a grate

covering the whole bottom, and two furnace doors, one for drawing out the burnt stone, the other for admitting air to the fire. Marl is said by Pliny to have been found out and used as a manure in Britain and Gaul. It was employed for the same purpose among the Greeks, and had never been used by the Romans, only because none had been found in Italy. The different varieties of marl, with the soils to which each was best adapted, are accurately classified and described by Pliny, who, on this as on many other occasions, surprises us by the extent and accuracy of his information.

Irrigation has in all ages been resorted to, to promote vegetation in the warmer climates, where the fertility produced by the natural overflow of their rivers presses its utility on their observation. It was practised by the Egyptians, whose canals still remain to attest the extent to which they carried it, by the Jews, and other Eastern nations. It was employed by the Romans to a considerable extent, both on grass and arable lands; more extensively, however, in the north of Italy on the plains of the Po, than towards the south. It was sometimes applied to fields of new sown corn; but it was on meadows where it was systematically practised. Their mode of conducting the operation was by causing the water to pass over the land with a gentle current, and in sufficient quantity to cover the roots. In Italy, France, and Spain, irrigation is still universal, and in England its use has been extensive and increasing since the reign of Elizabeth. Various methods of conducting the operation have been adopted in modern times; but it is found, after long experience, that none so effectually answers the purposes of irrigation as that which was employed by the Romans.

Sowing.—Their corn crops were regularly sown in drills that they might be hoed during their growth. They had no sowing machine; but the seed was carried in a basket and cast from the hand in the same manner as is now done. To cause it to rise in rows, it was either sown upon the plain field, which was then raised into drills with a plough with two mould-boards; or the land was first thrown up into drills, which, after being sown, were reversed. Drill-husbandry, therefore, though but a recent improvement in British agriculture, was in full operation two thousand years ago. It is little more than sixty years since it

was introduced into Britain; but it soon became pretty generally adopted, and its advantages still continue to be more extensively known and appreciated.

There were among the Romans, as among us, two seed-times, the autumnal and the vernal; the former was the usual one, the latter being resorted to only when the work of preparation could not be overtaken in time for the former, or where the land was so rich as to be thought capable of carrying a crop every successive year. They were careful not to prolong the autumnal seed-time beyond the winter solstice, or even within fifteen days of it, very properly perhaps, but for this fanciful reason, that seed when sown before the solstice springs up in seven days, but when later it scarcely appears in forty. Great attention was bestowed in apportioning the quantity of seed to different soils, situations, and climates. Much less was on all occasions given than is found necessary in this country. For free soils, less was thought sufficient than for clays, four modii on a jujerum (a modius being a little more than an English peck) being allowed for the former, and six for the latter. Less, likewise, was given at the commencement than towards the conclusion of the seed-time, the plants in the former case having time to tiller and spread before winter. It was an opinion among both Greek and Roman farmers, that the land sometimes took more seed than usual, independently of the intention of the sower; that "when it received it greedily, it was thought to consume it," and this was reckoned a very unfavourable omen of the future crop. The period is not very distant when the same idea prevailed among our own farmers, that in spite of all their efforts to sow at the ordinary rate, more than usual was sometimes required; and this, as among the Romans, was considered very inauspicious for the future crop. Their fears might be too well founded, since the whole is accounted for by the land being wet, thereby shortening the step of the sower, and affording an unfavourable bed for the seed.

Every precaution was taken to have seed of excellent quality and free of mixture or adulteration. The growth of the preceding year was accounted the best; and the largest and heaviest grain was selected by means of a sieve. A change of seed was not reckoned so important as it is among our farmers, there being in Italy less variety of soil and climate than in this country;

but when it was made, it was invariably from their warmer to their colder soils, their object being to obtain for seed, the very best and largest grain that could be selected from their own or the produce of others. This seems still to be the practical opinion of our own agriculturists, notwithstanding the conclusions of some scientific theorists, that wheat which was mildewed or shrivelled would vegetate equally well.

Reaping early, even before the grain was fully ripe, was, among the Roman farmers, considered advantageous, not only by avoiding any risk from the weather, but likewise from its being thought to improve the appearance of the grain, and the quality of the flour. The time is recent, when, among British farmers, such conduct would have been ridiculed as the height of folly. Early reaping, however, has of late been fast gaining ground in Britain, and its advocates discern in it the same advantages as were looked for by the Romans two thousand years ago. Three modes of reaping were in use; according to one, they cut the straw close to the ground, and laid it down in handfuls; according to another, the ears merely were cut off, by means of an iron saw at the extremity of a curved stick, and the straw left to be afterwards cut down; according to the third mode, they took the upper part of the stalks in their left hand and cut them in the middle. The last method, with the exception of the corn being cut considerably higher, and likewise the first, in which the corn was probably grasped with the left hand, are nearly the same with our mode of reaping. It does not appear that the Romans bound their corn into sheaves, though this was done by the Jews, Egyptians, and Greeks. A reaper among the Romans was expected to cut a *jugerum* of wheat in a day and a half; a *jugerum* of barley, legumes, and medica or clover, in one day. This is much more than is accomplished by our mode of reaping, five reapers, and sometimes more, being required to cut down an acre in a day, which is little more than a third of the extent gone over by as many Roman workmen.

The crops of the ancients were not, as in modern times, stacked in barn-yards, but were carried to what was called the *mobilarium*, a covered building; in which, like the large barns still used in some parts of England, the whole crop was collected and stored. Adjoining to this was the area or thrashing-floor, a cir-

cular space with a smooth hard surface, of from 40 to 60 feet in diameter. These were usually placed on the most elevated situation contiguous to the standing, the area being commonly entirely in the open air, but occasionally roofed, as they seem to have been in eastern countries, where Boaz is represented as sleeping all night in his thrashing-floor. On this floor the corn was spread about a foot in thickness, and was thrashed either by the feet of cattle or horses, or by a machine which they dragged over it, consisting, says Varro, of "a board, rough with stones or iron." From one of the allusions of Homer, a machine for thrashing seems likewise to have been used in Greece; and we know that among the Jews, besides treading out the corn with cattle, a machine, which is translated the *cart-wheel*, was used for the same purpose.

Pasturage and hay were considered the most productive departments of Roman husbandry, inasmuch that Cato, on one occasion, expresses an opinion, that even bad pasturage is more profitable than corn crops. The causes of this preference seem to have been, that grass lands were cultivated at very little expense, and produced an annual return; and what seems to have weighed with Cato, who always looks on bailiffs with a jealous eye, is, that when the farmer or proprietor did not reside on his estate, there was much less risk of his being defrauded by his overseer. Their meadows were regularly irrigated, and, when not pastured, afforded two cuttings, one in May and another in autumn. The produce from an acre is not distinctly mentioned by any of their authors; but, from a remark of Columella, that "a good mower cuts in a day a *jujerum* of meadow, and binds 1200 bundles of four pounds each," it seems probable that this quantity, which is nearly two tons, was the ordinary produce of a *jujerum*. This, with the addition of the second crop, will amount to not less than five or six hundred stones per acre, and we need not be surprised that their meadows were thought more valuable than their corn-fields, most of which only yielded a crop every alternate year.

When there was any scarcity of hay, that part of the straw which came from the thrashing-floor, and which consisted of the upper part of the stalk, was given to the cattle as feed. Their mode of preparing this straw is not a little remarkable; it was

either sprinkled with salt, or allowed to lie a considerable time moistened with brine. The application of salt to hay or straw is another practice in possession of the Romans which has been recently highly recommended, and successfully adopted in Britain.

In reviewing the agricultural operations of the Romans, we cannot fail to remark their similarity, on the one hand, to those which are most approved in modern times, and on the other, to those of the Jews and Greeks, as far as these appear from the slight allusions we have made to them; and, had our limits permitted, many more coincidences might have been noticed. We are not, therefore, warranted to conclude, as has been done, that they borrowed their knowledge of the art from the agriculturists of Greece, any more than we are to affirm, that the practices which are similar in modern husbandry were derived from the Romans. Roman agriculture had reached its height in the time of Cato, before much intercourse subsisted between Italy and Greece, and when the writers of the latter country had scarcely begun to be studied at Rome. There is nothing more difficult than to introduce among a people habits or practices which are foreign; and the agricultural peasantry are the least accessible to such changes. It is well known how little the agriculture of one country is influenced or improved by that of another, however superior, or however near. Very different modes of performing the same operation have often subsisted for ages, even in adjoining counties. It is not probable, therefore, that the husbandmen of Latium would quietly surrender their established usages, to exchange them for those of so distant a country as Greece. The military habits of the Romans, it is true, gave them a wider experience than usual in the practices of foreigners, and this, no doubt, had a beneficial effect on the progress of their rural improvement; but their system of agriculture was completed before their conquests extended to the Grecian territories. Whatever was derived, therefore, from the latter country, must have been brought with the rude migrators by whom Italy was peopled; and this, we conceive, could not have been much. At the commencement of the Roman state, every account represents their agriculture as in the rudest condition; their only implement for turning the soil was the spade; and,

had any progress been made in the cultivation and improvement of their lands, the rights of property would soon have become established and respected, and the frequent calls for partition by the Agrarian law would not have been heard.

It would appear, therefore, that just as modern agriculturists have been anticipated in most of their discoveries by the husbandmen of ancient Italy, so had the latter been anticipated by their predecessors in Greece ; and that, in the same manner as we have been gradually introducing improvements, which, though unknown to us, were practised two thousand years ago, so the Romans progressively advanced from rudeness to skill in agricultural affairs, unconscious that the steps they were taking had all been previously trodden by their predecessors in Greece, Syria, and Egypt.

IV.—*Produce of Roman Agriculture.*

The Romans were acquainted with almost all the varieties of grain at present sown in modern Europe ; *triticum* or wheat, *hordeum* or barley, *milium* or millet, a small grain which was sometimes made into bread, but was chiefly used for poultry and pigeons, *panicum miliacum* or panick, a grain somewhat smaller and inferior in quality to the former, used likewise for fattening fowls, and the *avena* or oat. The *triticum* was the same as our wheat, but they had a coarser variety which was sown on their inferior soils, called *far*, and which very nearly resembled *spelt*, now extensively cultivated in Germany. It anciently constituted the food of the Romans, and continued to be used in their religious rites. Barley was not cultivated to a great extent : it was considered a crop of unusual severity, and must be sown, it was said, either on land so rich that its fertility could not be destroyed, or so poor as to be fit for no other crop, and which, it would appear, had no fertility to destroy. It is not now found by any means so remarkable for severity, owing, probably, to our different seed-time, that of the Romans for barley being usually September ; so that it remained nine or ten months on the ground, instead of as many weeks, as in modern husbandry. It was on barley the horses of the Romans were commonly fed ; and, among the ancient inhabitants of Spain and

Gaul, the same use was made of it as is now done in Britain—they steeped it, and extracted a liquor resembling ale, on which they got inebriated. Of the froth of this liquor the ladies formed a wash for their faces, and a ferment for their bread.

Of their Leguminous crops the chief were the *faba* or bean, the *pisum* or pea, the *lupinus* or lupine, the *eroum* or tare, *cicer* a kind of vetch or small pea, and the *phaseolus* or kidney bean. The estimation in which these grains were anciently held, appears from their having given names to some of the most distinguished Roman families, as the Fabii, Lentuli, Pisones, Cicerones, &c., and from the ancient method of balloting by white and black beans. The turnip was cultivated, and considered a highly valuable crop among the Romans; they had two varieties, the one growing to a size and shape like our globe-turnip, the other pushing downwards a slender root, more resembling mangel wurzel. It appears that they were acquainted with a mode of laying them up and preserving them, so as even to improve their taste, and continue a supply for their cattle almost to the season of the following crop. They constituted part of the food of their slaves; and, by the costly manner in which they were dressed, they formed both a delicacy and an ornament on the tables of the wealthier Romans, being dyed in various colours, not excepting even the rich hue of purple. From a caution given to the farmer not to sow them too thick, lest their roots should be small, it would appear that they were unacquainted with the modern practice of thinning them to regular distances. The mode and advantages of transplanting were, however, understood, and, if extensively practised, would have answered the same purposes; it is mentioned, however, by Palladius, as a thing not generally known, and given as a receipt for procuring turnips of an unusual size. A superstitious notion forms another receipt for an abundant crop. "It is alleged," says Pliny, "from a nice observation, that if turnips are sown on the same day of the moon, on which the first snow fell in the preceding winter, there will be an extraordinary crop."

Turnips, in modern times, when in their first blade, are often injured or destroyed by a fly, which has thence been called the turnip-fly. In Italy, in the time of the Romans, they were subject to the attacks of the same, or a similar in-

sect, and, what is more remarkable, they had fallen upon almost the same means of defence. Their remedy, which Columella says he had himself used with success, was, on the day before sowing, to sprinkle the seed with soot and water. The same application, or, instead of soot, lime or ashes, is still regarded as a preventive.

The turnip has, from time immemorial, been cultivated as a food for cattle in Germany and the Netherlands; but in this country, though it may have grown much earlier in gardens, it has scarcely been in general cultivation for agricultural purposes above a century. Its introduction to our fields, however, formed an era in the history of British agriculture, and brought about, it has been observed, a complete revolution in rural economy. It has certainly been unfortunate for modern husbandry, that the Roman writers on the subject of agriculture lay so long unstudied, and that it was not till with our increasing knowledge, an increasing curiosity led us to explore their pages; but this was after we had made for ourselves most of the discoveries, of which they could, long before, have put us in possession.

Besides the domestic animals which we have already mentioned as employed in agricultural labour, others, in great variety, were reared upon their farms, and disposed of for the tables of the Roman nobility. Of these, birds of different kinds formed a considerable part: besides the common kinds of poultry, they had thrushes, larks; peacocks, and turtle-doves. They reared likewise snails, dormice, bees, and fish. When Rome was in her greatest splendour in the time of the Cæsars, these more refined species of animal food were very extensively reared, brought an extraordinary price, and formed an important item in the produce of a farm. We are informed by Varro, that well-fed birds, such as thrushes and blackbirds, were sometimes sold at 2s. each, and that 5000 of them were often annually disposed of from a single farm. Pea-fowls, according to the same author, were sold at £1 : 18 : 4, a pair of doves at the same price, but if very beautiful at a much more extravagant rate, sometimes as high as £8 : 6 : 8. Some kinds of fish were estimated at a similar rate; one gentleman placed as high a value on a bearded mullet as on a pair of his

best coach mules. The fish-ponds of Herrius and of Lucullus, from the quantity and value of the fish they contained, were sold for about £33,000.

With regard to the *profits* of Roman agriculture, it is difficult to speak with certainty, since, on this subject, there are always so many parts of the calculation which are variable in themselves, that it is impossible to obtain accuracy in any general result. Though the rent of land, the price of seed, and the grain produced, be all known, yet the labour and expense which the land must receive, greatly depend on seasons, accidents, and varieties of soil; and, without taking these into account, we cannot correctly estimate the profits of the farmer. Much cannot be determined by calculating the numerical returns of the seed, since the quantity required depends so much on the state and nature of the soil, that, of two crops equal in quantity, one may be giving a return of ten, and the other of forty-fold. Without hoping, therefore, to obtain an accurate statement of the profits of Roman farmers, we shall mention some facts regarding the rent and produce of their lands.

From the fertility of some lands in ancient times, very extraordinary returns are recorded. Isaac, when in the lands of the Philistines, is said to have sown, and reaped a hundred-fold. The banks of the Tigris, the Euphrates, and the Nile, fertilized as they were by the overflow of these streams, are said to have all yielded the same ample return. The small quantity of seed, however, which these soils required, rendered the actual produce not so extraordinary as these returns may seem. It is related also, that, from Bysacium in Africa, there were sent to Augustus nearly 400, and to Nero 340 stalks from a single grain. How this was accomplished we are not informed, but of its possibility there can be no doubt, as a much more extraordinary instance is recorded in the Philosophical Transactions for 1766. In this experiment, 21,109 ears or 386,840 grains, or three pecks and three quarters of wheat, were, by repeated transplantation, produced from a single grain.

No such remarkable returns were obtained in Italy. From four to six modii, or rather more than as many pecks, were sown on a jujerum, and the produce of wheat was in some places fifty, in others seventy-five modii, which is a return of from ten to fif-

teen fold, and is equal to from 21 to 32 bushels on an English acre. The rent amounted to about 16 modii per iugerum, which is about one-fourth of the produce, leaving three-fourths for the expense and profits of the farmer. Wheat, however, was one of his most valuable crops, and it must not be supposed that this proportion remained to him of the whole produce of his farm. In the time of Columella, about a century later, their returns had greatly decreased. So much had agriculture fallen into neglect, that he conceived it necessary to begin his treatise by proving that the earth had the same principles of fertility as before, and that its present barrenness was owing to the indolence or ignorance of its cultivators. Its produce, in his time, seems not much to have exceeded the half of what was formerly reaped, from four to five after one being their usual returns.

By this time the Romans had begun to depend chiefly on the supplies of the provinces; and it is worthy of the consideration of those who speculate on the subject of corn importation, to attend to the different prices of grain in Italy, when it was raised by an active agricultural population in sufficient abundance to meet the demands of their home consumption, and when it was plentifully imported from the distant dependencies of the empire. At the former period we have the price of wheat at about three sestertii per modius, which is equal to about 16s. per quarter. On the other hand, in the time of Columella and Pliny, the ordinary price of wheat was 12 sestertii per modius, which is at the rate of 62s. a quarter. While, therefore, they were in the receipt of an abundant foreign supply, their prices rose from 16s. to 62s. per quarter. It is no less instructive to attend to the variation which had taken place on the rent of land during the interval between these two periods. It had not risen to the extent that we might have anticipated from the rise which had taken place on the prices of grain. In the time of Varro about 53 sestertii, or nearly 8s. 6d., were paid for a iugerum; in the time of Columella 40 sestertii, or about 6s. 6d. This, however, is not taking into account the change which had taken place on the value of money; and, by converting the money-rents into grain, the variation will be much more remarkable, as well as much more correct. The rent of a iugerum, in the time of Varro,

was equal to 16 or 17 modii, while, in the time of Columella, it amounted to no more than $8\frac{1}{2}$, which is only about one-fifth of the former.

Without entering into any reasoning on the subject, we may simply mention, in illustration of this, the corresponding changes of price which have been coincident with exportation or importation in our own country. From 1688 to the year 1765, exportation was encouraged by a bounty, and importation virtually prohibited; but, during that period, though the exports were very considerable, the prices of grain were much lower than during an equal number of years preceding 1688. In 1765 the corn laws began to be modified, exportation was prohibited, and importation permitted, at first free, and afterwards on payment of a certain duty; but, since that date, the average price of grain, during every successive period of ten years, had considerably risen, until the conclusion of the war.

The price of land, in the time of Columella and Pliny, was twenty-five years' purchase, it being common, as they inform us, to receive 4 per cent. for capital so invested. The usual interest of money at that time was 6 per cent.

The influence of the Romans on the agriculture of the provinces was always beneficial. Their conquests, instead of spreading desolation over the countries they subdued, insured, on the contrary, their permanent improvement. It was uniformly the object of their commanders, as much as possible, to civilize and increase the comforts of the conquered nations. Their soldiers were not suffered to riot in towns, or loiter in their camps, but were kept employed in works, often, no doubt, such as might give stability to their own dominion, though even these presented a view of many of their arts to the barbarous nations, but frequently such as conferred a lasting benefit on the nations they were subduing. Many remains of these still attest their labours in facilitating the communication between different parts of the country. Their soldiers likewise, being chiefly drawn from the plough, were practically acquainted with agriculture, which they put in practice wherever they were stationed, and taught to the inhabitants where it was unknown. The agriculture of Britain, from Land's End to the Forth, was greatly benefited by the invasion of the Romans, as sufficiently appears

from the immense quantities of grain which were exported while it remained in their possession. The emperor Julian, in the fourth century, built large granaries to receive these supplies, and, on one occasion, sent a fleet of 800 ships to convey it to the mouth of the Rhine, whence it was carried up the country for the support of the plundered inhabitants. The Britons were not only taught how to cultivate their fields, but compelled to put their lessons in practice, as a tribute of a certain quantity of corn was imposed on every province of the country, as soon as it fell under the dominion of their invaders. But though the Romans communicated freely their knowledge of the arts of peace, they could not or were not anxious to inspire them with their martial spirit, or teach them the arts of war; and, soon after the Britons were left to themselves, the progress of their agricultural improvements was arrested by the inroads of the Picts and Scots, and by the invasion of the Saxons.

Among the Romans themselves, agriculture, it has already been observed, was at its height in the time of Cato; in that of Varro it had already begun to decline, and the writings of Pliny and Columella abound with complaints of its neglect. Many of their greatest men and most extensive proprietors disregarded the culture of their estates in Italy, and trusted to the ampler revenues which they drew from the provinces. With the boundless luxury which prevailed among the Roman nobility, debt of course was contracted; and to uphold their establishments, they were under the necessity of mortgaging their estates, and then of oppressing their tenants, in order to wring from them the exorbitant interest which they had to pay for these supplies. The farmer in consequence was discouraged, and lost his capital, his industry, and his enterprise. The decline of agriculture was farther hastened by the civil wars which prevailed at the conclusion of the second century; and by the continued tyranny and misgovernment of the emperors, in the third. The removal of the seat of empire to Constantinople, in the fourth, laid Italy open to the Goths, who soon swept away all that remained of Roman agriculture, as of every other art of peace.

C.

ESSAYS ON THE ORIGIN AND NATURAL HISTORY OF DOMESTIC ANIMALS. *By JAMES WILSON, Esq. F. R. S. E. M. W. S. &c.*

ESSAY IV.

ON THE ORIGIN AND NATURAL HISTORY OF THE SHEEP AND GOAT.

DOMESTICATION, or at least a long continued subservience to the human race, and a change of climate and locality, have been productive of several remarkable alterations in the external characters and general aspect of the sheep. Although that invaluable animal and the goat are usually regarded by naturalists as being not only specifically but generically distinguished, the latter or generic separation is, I believe, founded chiefly upon characters which have arisen in consequence of the power and influence of man. In a state of nature the sheep is not less active and energetic than the goat, its dimensions are fully greater, and its muscular strength is at least equal, both in force and duration. It is also an alpine animal, fearless of crag and cliff, and dwelling, indeed, by preference among the steepest and most inaccessible summits of lofty mountains. Among its native fastnesses it is seen to bound from rock to rock with inconceivable swiftness and agility.

The form and structure of the sheep, in its natural and unsubdued condition, differ in few material points from those of the goat. Even the skeletons of these two animals, when compared together, present no points of difference which pass beyond the range of merely specific distinctions, and their digestive and other systems are equally conformable. We also know that hybrids, or mixed breeds, have been produced between the goat and the ewe, and between the ram and the she-goat, and it has even been asserted that these mule animals themselves were not, as usually happens, entirely unproductive,—a fact which, if ascertained, would prove a closer natural relationship to exist between the two species in question, than that between the horse and the ass.

Such alliances, however, are no doubt so rare and uncertain, as to occasion nothing more than an anomalous combination of characters in certain individuals, which speedily becomes effaced from the tablet of nature, and leads not to the production of any new or permanently intermediate race. Whatever dreams the mystical imaginings of some modern philosophers may have given rise to regarding the origin of species, and the gradual evolution of one form of animal life as connected with or consequent upon another, it is not a bad rule, though a tolerably old fashioned one, to believe that in the origin of species nothing was left entirely to such casual intercourses, but rather that every thing was not only divinely planned, but directly performed, by the same simple though Omnipotent fiat which gathered together the waters under the heaven, and made the dry land appear, with all the beautiful, infinitely varied, and most harmoniously adapted inhabitants of either element,

“ From Thule to Hydaspis pearly shore.”

The form of the horns, which are curved backwards in a single arch in the goat, with their convexities forming the upper lines, and the straightness or even slight concavity of the chaffron or outline of the face, are perhaps the most important characters of distinction between that species and the sheep. The latter character, indeed, has been nearly effaced by cultivation in the last-named animal; for it may be observed that in all the improved breeds the profile is much straighter than in those which have been less assiduously attended to by breeders. The existence of a beard can scarcely be considered as a generic character, although it may serve sufficiently for the purposes of specific discrimination. There are, indeed, certain species which, if the sheep and goat be regarded as forming the types of two distinct generic groups, it becomes a matter of no little difficulty to ascertain, from their ambiguous combination of characters, to which of the groups they ought to be assigned. Linnæus no doubt regarded them as distinct, and Cuvier continues to hold them in generic separation; but as such was neither the opinion nor the practice of Pallas and Illiger among the “ illustrious dead,” nor of Blumenbach and Ranzani among the living, we

hold ourselves entitled, the more especially as it suits our present convenience, to consider them for a time in juxtaposition*.

We shall commence with the Sheep. The generic characters applicable to the different species and varieties may be stated as follows: Horns directed backwards, downwards, and forwards, in a somewhat spiral form. Chaffron naturally convex. Sinus at the internal base of the toes in both the fore and hind feet. Two smaller toes, or rudimentary hoofs, behind the larger anterior pair. Two inguinal teats. Tail varying in length among the domesticated kinds, but always short in the wild races. The teeth are—8 incisives in the lower jaw, none in the upper; no canine teeth in either jaw; molars 6 in each side of both jaws;—Total 32.

Wild races of this animal, not as yet, however, in every instance clearly distinguished from each other, inhabit the elevated regions of Europe, Asia, Africa and America. Their geographical distribution is therefore very extensive, and exceeds that of the goat, to use a summary expression, by a couple of continents; for I doubt the fact of any wild goat, allied to the domestic breed, occurring among either the continental or insular Alps of Europe; and the Rocky Mountain goat of America seems rather entitled to a place among the antelopes†.

The principal unsubdued races of the sheep are the Argali of Siberia, the Mouflon of Sardinia, Crete, and Corsica, the Bearded Sheep of Africa, and the Rocky Mountain Sheep of America. These four quadrupeds differ greatly, in the first place, in their geographical position; and, in the second place,

* Baron Cuvier himself seems indeed scarcely satisfied with their generic distinction. "Ils (les moutons) méritaient si peu d'être séparés génériquement des chèvres, qu'ils produissent avec elles des métiis féconds."—*Regne Animal*, t. i. p. 277.

† The synonymy of the last-named animal is confused and contradictory. It is the Wool-bearing Antelope, *Antilope lanigera* of Major Hamilton Smith—the Mountain Sheep (though widely distinct from the true *Ovis montana*) of Jameson and Ord—the *Maxama dorsata et sericea* of Rafinesque—the *Rupicapra Americana* of De Blainville—the *Antilope Americana* of Desmarest—and the *Capra Americana* of Richardson's excellent *Fauna-boreali Americana*. We cannot too much recommend the last-named work to those who desire an accurate account of the quadrupeds of British North America.

in several of their external characters, though these latter have not yet been detailed with sufficient fulness and precision to enable us to say whether each differs specifically from the other, or is rather its natural representative under a change or modification of climatic influences. Be this as it may, it is certain that from one or other of these unsubdued tribes, our domestic sheep have been originally derived.

I need scarcely remind the reader of the very ancient subservience of this animal to the human race. It is the first recorded in the Scriptures as under the dominion of man. "And Abel was a keeper of *sheep*, but Cain was a tiller of the ground *." Its domestication thus appears to have been almost coeval with the creation of our own species. Adam himself, in obedience to the Divine mandate, which "sent him forth from the garden of Eden to till the ground from whence he was taken," was the first agriculturist, and Cain the second; but Abel appears to have been the earliest shepherd, and to him we probably owe the taming of some other domestic animals. It is not too much to suppose that the greater mildness and more affectionate nature of his temper and disposition, which rendered him the more acceptable both to God and man, were not only compatible, but closely connected, with his love and knowledge of the brute creation. Of these the goat appears to be the next in succession, as applied to the uses of our own species, then oxen, asses, camels, and lastly horses. The first mention of the mule, though prior to that of the horse, is of such a casual kind as to lead to no certain conclusion whether it was then known as a beast of burden. The 36th chapter of Genesis, which details the generations of Esau, has the following passage (verse 24th): "And these are the children of Zibeon; both Ajah, and Anah: this was that

* *Genesis*, ch. iv. v. 2. Sheep-shearing is mentioned in *Genesis*, ch. xxxviii. v. 13, "And it was told Tamar, saying, Behold, thy father-in-law goeth up to Timnath to shear his sheep;" and, at a later period, the festivities of that season were taken advantage of by Absalom to slay his brother Amnon. "And it came to pass after two full years, that Absalom had sheep-shearers in Baal-hazor, which is beside Ephraim: and Absalom invited all the king's sons." "Now Absalom had commanded his servants, saying, Mark ye now when Amnon's heart is merry with wine, and when I say unto you, Smite Amnon, then kill him, fear not: have not I commanded you? be courageous, and be valiant."—2 *Sam.* ch. xiii. v. 23, 28.

Anah that found the *mules* in the wilderness, as he fed the asses of Zibeon his father." Whether these animals were the product of wild horses with the domestic asses, or belong to that distinct species of the genus *Equus* called *Hemionos*, or half ass, by the ancients*, more recently described by Pallas, and still found in a state of nature in some eastern countries, is a point which has probably not yet been determined by commentators, if it has in any way attracted their attention.

The most remarkable external change which domestication has produced on sheep, is the conversion, as it is usually called, of hair into wool, or, to speak more accurately, the prodigious development of one of the constituent portions of the coat, and the decrease or disappearance of the other. All animals inhabiting a cool or temperate climate seem supplied with both a woolly and a hairy covering, the former being usually short and close, and entirely concealed by the latter, on the length, colour, and texture of which the external appearance of the species in a great measure depends. These two kinds of covering are very observable in bears and wolves, and also in the different and more peaceful races of wild sheep, and nothing like either a metamorphosis or a new creation is necessary to produce the remarkable alteration in the domestic breeds. Some countries, even of Asia, have a strong natural tendency to prolong the fur of animals, and in such districts the short hairy covering of the goat has attained to great length and extreme fineness, while the under down, or woolly portion of the coat of the Argali or wild sheep, has almost obliterated every trace of hair. "The high western basin of Cantal Kōnti, or Cashmere," says Major Smith, "the secondary valleys of ancient Taurus and Caucasus, the Chorassan and Caramania, and at length the environs of Angora, or central basin of Asia Minor, about the sources of the Halys and Sakaria, may be considered as the favoured nurseries from whence the improved fleece-bearing animals have gradually spread over the rest of the world. It was at the foot of Caucasus that Jason obtained his celebrated spoils."

Naturalists do not seem entirely to accord in opinion regard-

* See *Journal of Agriculture*, vol. ii. p. 53.

ing the true source of our domestic breed ; for while the prevailing sentiment is certainly in favour of the mouflon of Crete and the larger islands of the Mediterranean, yet many lean to the opinion that the Asiatic Argali is the original, while others support the claims of the African species.

1.—THE MOUFLON, OR MUSMON OF THE MEDITERRANEAN ISLANDS.

(*Ovis Ammon*, GMEL. *Capra Ammon*, LINN. *Syst. Nat.* 12th edit. *Ovis musimon*, PALLAS and GOLDFUSS. *Mouflon* of BUFFON and F. CUVIER. *Ovis Argali*, SHAW. *Ovis aries*, (Race sauvage considérée comme le type primitif), DESMAREST. *Ovis musmon*, HAMILTON SMITH. *Mufione* in Sardinia. *Muffole* in Corsica. According to some writers called also *Mufro* (the female *Mufra*) in the above-named islands.)

THIS species was known to the ancients under the name of *Musmon*. It measures about three feet and a half from the nose to the insertion of the tail, and the head is eight inches long from the muzzle to the base of the horns. Its height from the highest part of the back to the ground is two feet six inches. The distance from the base of the horns to the withers is 11 or 12 inches, and from the withers to the insertion of the tail about 1 foot 10 inches. The tail is from 3 to 4 inches long, and the horns of the male are nearly 2 feet in length. These horns are of a yellowish-grey colour, thick, and wrinkled, particularly at the base. The ears are of a medium size, straight, pointed, mobile. The eye is accompanied by a slight trace of a *larmier* or lachrymatory opening, as in the deer. The neck is large, the body thick, muscular, and of a rounded form. The limbs are robust ; the hoofs short, and of a yellowish-grey colour. The tail is naked on its inferior surface. The body is protected by two kinds of covering,—by a fine thickish grey-coloured wool, of which the filaments are spirally twisted in the manner of a cork-screw, and by a stiffish silky hair, of no great length, but sufficient to conceal the appearance of the wool beneath. There is no wool whatever upon the head, of which the hair is very short and stiff. The prevailing colour is a dull or tarnished fawn, deeper along the dorsal line, and mingled with a few black hairs on the head, neck, shoulders, back, flanks, and outer

surface of the thighs. The lower part of the neck, as far as the chest, the anterior base of the fore legs, the margins of the coloured portions of the flanks, and the tail, are blackish. The upper parts and sides of the face, and a line which rises from the commissure of the lips, and, extending above the eyes, joins the corresponding line of the other side, are likewise black. The anterior portion of the face, the part beneath the eyes, the insides of the ear, the cannon of the legs, the abdomen, the buttocks, and the edges of the tail, are white. The inner surface of the limbs is of an obscure grey. A large spot of very pale yellow is discernible in the centre portion of each of the sides. The anterior of the mouth, the nostrils, and the tongue are black.

During the winter season the coat of this animal is closer and better furnished, and also exhibits somewhat more of the blackish colour, than in summer. During that season, too, the covering of the lower part of the neck forms, from its fulness, a kind of cravat or dewlap, and the dorsal line, especially above the shoulders, is very dark. The female musmon differs from the male principally in the smaller size of her horns, which indeed are sometimes entirely wanting *, and by the comparative thinness of her coat. The young are characterized by a purer colour than the adults, and their hinder extremities are of a pale fawn colour instead of white. The upper parts of the tail are also of a brownish fawn colour instead of black. Their horns commence growing very soon after their birth, and are about half a foot long at the end of the first year.

The musmon inhabits the loftiest parts of Crete, Corsica, and Sardinia, the western mountains of European Turkey, the Isle of Cyprus, and probably other islands of the Grecian Archipelago. It is not supposed to occur in more northern countries, unless the

* " Suivant la plupart des auteurs, les prolongemens frontaux manquent entièrement chez les femelles ; suivant d'autres, au contraire, ils existent chez elles, mais tres-petits et tres differens par leur forme de ceux des males ; mais cette dernière opinion pourrait bien avoir son origine dans quelque confusion entre le Mouflon et l'espece suivante dans laquelle les deux sexes ont des cornes ; du moins pouvons-nous assurer que tous les individus femelles que nous avons examinés, soit vivans, soit préparés, etaient entièrement privés de prolongemens frontaux."—*Isidore Geoffroy St Hilaire*, in *Diet. Class. d'Hist. Nat.* t. xi. p. 260.

identity of this species with the Siberian Argali should be afterwards demonstrated. With the exception of the parts of Turkey above mentioned, it was believed not to occur in modern times on any of the continental territories of Europe. It was, however, mentioned as an inhabitant of Spain by Pliny, and Colonel Bory St Vincent has lately informed us, that he both saw and shot them among the Mediterranean regions of that peninsula. Indeed, according to the last-named author, the species is still spread in tolerable abundance over the mountainous parts of the ancient kingdom of Murcia *.

The musmon is by nature a gregarious animal. According to M. F. Cuvier, it is remarkable for the imperfect development of its faculties, whether in the wild or reclaimed condition; and thus, in the opinion of that author, if it be the source of our domestic races, we need be at no loss to discover, "in the feeble judgment which characterizes the former, the true origin of the stupidity of the latter." It appears from observations lately made in the menagerie of the French museum, that domestication has little effect in developing the feelings or affec-

* Doubts are, however, entertained by some observers in regard to the identity of these species. "Columella, who, in the reign of Claudius, crossed the breed of his Tarentine sheep with wild rams brought to Gades from Africa, and which were of a *singular* colour, would not have looked for the African, if the musmon of Spain, then abundant upon all the mountains of the Peninsula, had been viewed by him as the same animal; nor could the argalis of Africa, which are at present known, be the kind mentioned, for *their rufous* colour is not singular, but very common in Barbary. Yet this extraordinary colour remained for successive generations, though the hair was replaced by wool; and we find that the Morocco sheep are very generally marked with spaces of chocolate or liver coloured brown: that these races have also an arched chaffron, long legs, more or less hair among their fleeces, and the points of the horns turned inwards. The musmons are distinguished, it is true, by a very short tail, and by the black colour of the mouth and tongue; but the variations in the tail are common among the different domestic breeds, and partially black mouths are not more rare, than a similar distinction in certain breeds of terrier dogs. Of the facility of breeding this species with our domestic sheep, proof was obtained from the specimen brought to England by the celebrated Pascal Paoli, which was the parent of a mixed progeny here; hence there is some ground to suspect that the musmon and ophion of the ancients were not synonymous names for the same animal, and that the wild sheep of Spain and the Carpathian mountains are not the mufro of Corsica."—*Griffiths' Animal Kingdom*, vol. iv. p. 324.

tions of these animals. They become habituated to the presence of new objects, and not only lose their terror for the human race, but seem to acquire great confidence in their own strength. Familiarity breeds contempt, and they occasionally, the males in particular, attack their keepers with the greatest fury. But chastisement produces no effect in rendering them less mischievous; and if some individuals become more fearful in consequence, it is not from their spirit being subdued, for they thenceforward consider their guardians rather as enemies than as lawful masters. They seem, indeed, scarcely capable of drawing any line of distinction between those who follow the two extremes of good and bad treatment, and exhibit neither confidence, affection, nor docility,—differing widely in this from even the most carnivorous tribes, none of which withstand the ameliorating influence of kindness and goodwill.

M. F. Cuvier records * an instance of what he regards as extreme stupidity on the part of these animals. Such as live in the Garden of Plants are exceedingly fond of bread, and when any one approaches their barrier, they draw near with a view to obtain it. This device is frequently made use of to entrap them, so as to enable their keepers to fasten collars around their necks, to prevent accidents previous to any one entering their domiciles; and, although they seem exceedingly tormented and unhappy when thus held in bondage, they never acquire, from experience, sufficient sagacity to mistrust the collar which they see held in one hand, if there is a slice of bread in the other. They are, in short, unable to combine their ideas in such a manner as to connect the collar with their captivity; and the younger Cuvier consequently holds them in some contempt. Now, we feel rather inclined to advocate the cause of the mouflon; and, without doubting that Mr F. Cuvier, from his long continued experience as Director of the Parisian Menagerie, will continue, by some means or other, to circumvent the most sagacious sheep that ever enters the capital of the Great Nation, we yet cannot see, in the fact recorded, any thing more than another fact easily evolved from it, viz. that the animal in question had so far familiarized itself with man, as to feel the desire

* *Histoire Naturelle des Mammifères. Première Livraison.*

of obtaining a favourite morsel more strongly than the fear of disagreeable consequences. There is no "bread at discretion" among the mountains of Sardinia; and more intellectual creatures have suffered worse consequences from their love of good cheer. "It is not," says Major Smith, "under the confined circumstances in which this animal was placed, but it is in the country, where no direct constraint has cramped their faculties, and above all, in their wild state, that we should study and appreciate their moral qualities. Now, if we turn our view to an intermediate state, as, for instance, the mountain sheep of Wales, half wild from the nature of the country, we find them not crowded in close herds, because experience has taught them to feel secure from carnivora, but scattered in groups of twelve or fourteen; one of which is, nevertheless, on the look out from a rock or peak, to give warning of the approach of any strange object, and to give the hissing signal of retreat, when all betake themselves to the most inaccessible parts of the mountain. Such is also the practice of the American, and no doubt of all the Argalis, whence the difficulty of arriving within gun-shot, which is as well known in Kamschatka as among the Cree Indians. If they be shot, it is in general because, feeling secure from dogs, they will stop and look with curiosity from some lofty crag upon their cry beneath, while the wary hunter steals unperceived upon them. Nor are their affections obliterated in a domestic state. He who, in shearing-time, when the lambs are put up separately from the ewes, witnesses the correct knowledge these animals have of each other's voices,—the particular bleating of the mother, just escaped from the shears, and the responsive call of the lamb, skipping at the same moment to meet her,—its startled attitude at the first sight of her altered appearance, and the reassured gambol at her repeated voice and well known smell;—he who observes them at these moments will not refuse them as great a share of intelligence as their ancient subjugation, extreme delicacy, and consequent habitual dependence on man, will allow *."

Almost all French writers, it may be observed, estimate the abilities of the sheep at the lowest rate, and as scarcely sufficing

* Griffiths' *Animal Kingdom*, vol. iv. p. 314.

for its self-preservation. Buffon, while admitting its extreme and, indeed, unrivalled utility to the human race, regards it as highly contemptible in itself, from its entire deficiency in sentiment and all interior qualifications. According to his views, it is of all animals the most insensible, and possesses the fewest resources from natural instinct; and M. Desmarest accuses the female of being utterly devoid of maternal attachment, an assertion which every one will gainsay who has seen and heard, amid the "pastoral melancholy" of the Scottish mountains, the piteous expression of her sorrow, when following the shepherd with a dead lamb *. It is probable that the ravages of wolves and bears in some of the continental countries of Europe, and the consequent necessity of a more continuous attention and interference on the part of the shepherd, may have rendered the flocks of those countries more dependent, and therefore less energetic, than our own. But many of our British breeds are endowed with a fair proportion of instinctive acumen, and are observed to manifest their intelligence in a variety of ways. "The mutton," says the Reverend George Low, writing of Orkney, "is here in general but ordinary, owing to the sheep feeding much on sea-ware, to procure which these creatures show a *wonderful sagacity*, for no sooner has the tide of ebb begun to run, but they, though at a great distance, immediately betake themselves full speed, one and all, to the shore, where they continue till it begins to flow, when they as regularly retire †." Numerous other instances might be brought forward to prove the fallacy of M. Desmarest's opinion, that sheep are now so totally under the empire of man, and so degenerated in consequence, that they could not return to a state of nature,

* "Alors (l'époque du rut) un sentiment de jalousie irrésistible les porte à se battre entre eux, ce qu'ils font en s'elargant les uns contre les autres, et en se frappant à grand coup de tête. Hors ce temps, ils sont dans un état complet d'indolence et de stupidité. La femelle ou *brebis* ne semble avoir qu'un foible attachement pour sa progéniture, et se la voit enlever sans chercher à la retenir." "Ils ne savent éviter aucun danger, et même ils sont incapables de chercher aucun abri contre les intempéries de l'atmosphère. Ils savent à peine trouver leur nourriture dans les terrains peu abondans en végétaux, et en cela ils sont loin de montrer un discernement comparable à celui des chèvres."—*Dict. des Sciences Nat.* t. 33. p. 217

† *Fauna Orcadensis*, p. 9.

but would inevitably perish and become extinct, if abandoned by the human race *.

In a state of nature, the musmon scarcely ever descends from the summits or the highly elevated portions of its native mountains, of which neither the latitude nor the elevation admits a perpetuity of snow. They dwell in troops, which scarcely ever exceed a hundred individuals, at the head of which is usually placed an old and robust male. About the month of December or January, these larger troops divide themselves into less numerous bands, consisting of a single male and a limited number of females. For some time after this period, when the males encounter each other fierce battle ensues, and one of the combatants is frequently slain. The successful competitor succeeds, after the Turkish fashion, to the harem of the vanquished. The females carry their young five months, and usually produce twins in April or May. They are tender, affectionate, and

* “ Ces animaux sont totalement sous l'empire de l'homme, et leur espèce, dégénérée au dernière point, est peut-être la seule, parmi celles des animaux domestiques, qui ne pourroit pas revenir à l'état de nature, si elle se trouvoit même placée dans les circonstances les plus favorables à son existence. Une fois abandonnée par l'homme, elle ne tarderoit pas à disparaître.”—*Dict. des Sciences Nat.* t. 33. p. 217. Mr Low, in describing the rough method of obtaining the wool which prevailed in Orkney in his time, expresses himself as follows: “ About mid-summer, there is a particular day published for *rowing*, when all the men in the parish, attended with their dogs, turn out, and drive the whole flock, without any preparation of washing, into narrow pens, and from thence, I may say, to the place of execution, where the wool is torn (not shorn) off their backs, an operation which brings the whole blood into their skin, and is not only disgusting, but, if the season proves harsh, is the cause of great destruction. But, however cruel it may seem, it is almost the *only notice that is taken of these useful animals by their unfeeling masters till that time twelvemonth.*”—*Fauna Orcadensis*, p. 7.

The custom of pulling instead of shearing off the wool was probably the original practice of most nations. The Latin term *vellus*, a fleece, is no doubt derived à *vellendo* from pulling or being torn away, and that part of the Palatine Hill of Rome called *Velleia*, was so named on account of its being the spot where the Romans pulled their wool, before the Etruscan method of shearing was introduced. “ *Palatini collis Romæ*,” Cato observes in his Book of Originals, “ *altera pars Velleia appellata fuit, a vellenda lana ante Hetruscam tonsuram incolis monstratam.*” The modern method was not even universally followed in the time of Pliny. “ *Oves non ubique tondentur,*” says that author, “ *durat quibusdam in locis vellendi mos; qui etiam nunc vellunt, ante triduo jejunas habent quo languidæ minus radices lanæ retinent.*”

courageous, in defence of their young. The latter become adult in the course of their third season.

There is reason to suppose that a species of wild sheep, in ancient times, inhabited Britain and the Isles. Boethius alludes to the sheep of St Kilda, as larger than the largest goats, with their tails reaching to the ground, their horns longer, and as bulky, as those of an ox; and Pennant mentions the figure of an animal of this description having been found pictured on a bas relief taken out of Antoninus's wall, near Glasgow.

We have said that the question is still undetermined in regard to the origin of our domestic breeds. We know, however, that the Corsican musmon, brought to this country by General Paoli, became the parent of a mixed progeny; and, if Pliny can be regarded in the light of an authority, the wild sheep of Spain frequently intermingled with the domestic race. The produce were known by the name of *Umbri*. The Corsican musmon, like the domesticated animal, sometimes varies in colour, and occasionally occurs with large black patches about the neck, presenting a resemblance in that particular to certain of the African and Indian varieties, which seem, both in form and colour, to approach the most nearly to the original stock. All the wild species of sheep have the chaffron greatly arched, and this peculiar form of the nasal bones is found to increase with the degeneracy of the domestic breeds both of goats and sheep, and is even an unfavourable character in the horse*. Major Smith seems to suspect that even the Musmon itself may not be a genuine wild animal, but an African domestic breed once imported, and only partially restored to its primitive characters, by the security of its insular situation from carnivorous animals after it had escaped from the influence of man.

2.—THE BEARDED SHEEP OF AFRICA.

(*Ovis Tragelaphus*, CUV. DESM. *Mouflon d'Afrique*, GEOFF. ST HIL. *Bearded Sheep*, PENNANT, SHAW. *Ophion*, PLINY? *Bearded Argali*, HAM. SMITH.)

Hair on the lower part of the cheeks and upper jaws extremely long, forming a divided or double beard; hairs on the sides and body short—on the top of the neck somewhat longer,

* Griffiths' *Animal Kingdom*, vol. iv. p. 323.

and a little erect. Whole under part of the neck and shoulders covered with coarse hairs, not less than fourteen inches long: beneath the hairs, on every part, there is a short genuine wool, the rudiments of a fleecy clothing. Colour of the breast, neck, back, and sides, pale ferruginous. Tail very short. Horns close at their base, recurved, twenty-five inches long, eleven in circumference at the thickest part, diverging and bending outwards, the points being nineteen inches from each other.

According to Pennant, this species was accurately described by Dr Caius, from an individual brought into England from Barbary, so far back as the year 1561. The learned physician named it *Tragelaphus*, on the supposition of its being identical with the animal described under that name by Pliny. The figure published by Pennant (and copied by Shaw) was taken from a print by Bassan, after a painting by Oudry of the living specimen in the menagerie of the French king.

Some confusion has arisen in the history and synonymy of this animal, from a want of accordance between the figure above referred to and the written description. The horns, rather distant at their bases, are represented as forming a spiral turn like those of the Argali, and this circumstance has, no doubt, induced Dr Shaw to regard the species rather as a variety of that animal, than as truly distinct. There is a pretty large undivided beard beneath the chin, but no appearance of the long tufts of hair about the knees, which form a remarkable and characteristic feature in the more recent descriptions of the African species. It is supposed that this individual may have been of mixed blood, like those not unfrequently alluded to by ancient writers*.

The bearded sheep inhabits the desert steeps of Barbary, and also occurs in the mountainous parts of Egypt, according to the testimony of M. Geoffroy St Hilaire, who figures the species in the great French work on that country, published by the "Institute of Cairo." According to the French author, it is not larger than a common ram, and the throat, but not the under jaw, is furnished with long pendulous hairs. There is no mane upon the neck, nor tufts upon the shoulders. The knees are protect-

* The great length and irregular form of the hoofs in the representation (see *Shaw's General Zoology*, vol. ii. pl. 202), indicate that the individual pictured had dwelt for a long period in captivity.

ed by a kind of ruffles (manchettes) composed of straight hairs about 5 inches long, hanging quite round them. The tail is nearly 6 inches long, and the general colour pale rufous.

The specimen in the Paris Museum was shot near Cairo, although it does not appear, from what we have been able to collect on the subject, that it occurs habitually in the neighbourhood of that city. The shape of the horns differs in this respect from that of the common sheep, that they are rather of a square than triangular form at the base. Their extremities are directed inwards, and, instead of being blunt or rounded, they are much more sharp-pointed than usual. They also approach each other very closely at the base, differing in this, as in several other particulars, from the figure in the works of Pennant and Shaw. Some zoologists regard the species as distinct from the bearded sheep, usually so called, and it has, accordingly, been described in France under the name of *Mouflon à Manchettes*, *Ovis ornata* *.

The bearded sheep, as described by Dr Caius, was nearly as large as a stag, as it measured 3 feet 6 inches at the shoulder, and 4 feet 6 inches from the nape of the neck to the tail. The horns were 1 foot 1½ inch in circumference at the base, and only 1 inch asunder in front; they were bent backwards and downwards, angular, of a black colour, and about 2 feet long. The beard was formed by long hairs on the cheeks and under jaw, and was divided into two lobes. The neck was thick, of no great length, and beneath it hung a quantity of long hair from the throat to the knees †. A setaceous mane stood up along its neck, and particularly about the withers, where it was tufted, lengthened, erect, and of a darker colour than the rest of the body, which was of a blackish rufous, resembling the winter dress of the stag. The knees seemed bent backwards, were unfurnished with callosities, but protected by long dense hairs, as if to afford them protection while bounding. The legs were rather slender, and the outer hoofs of the fore feet exceeded the inner in size. The *incisors* were only 6 in number; and the nostrils were black and divided from each other by a perpendi-

* See *Dict. Classique d'Hist. Nat.* t. xi. p. 264.

† In the Parisian specimen I may observe, that the hair, just before the bifurcation of the beard takes place, measures about 14 inches in length.

outer line of the same colour. This animal was gentle though petulant, and loved to ascend high places and the roofs of houses. It ran swiftly, and sometimes made prodigious bounds. The name *Tragelaphus*, bestowed on it by Caius and Gesner, was borrowed, perhaps not very appropriately, from Pliny, by whom it was applied to a species with a forked beard (from whence the designation), said to inhabit the banks of the Phasis in Asia, and more probably a goat than a sheep.

3.—THE ARGALI, OR WILD SHEEP OF ASIA.

(*Capra Ammon*, LINN. 12th Ed. *Stephis Baransi*, G. S. GMELIN *. *Ovis fere Siberica*, vulgo *Argali dicta*, PALLAS †. *Ovis Ammon*, GMEL. SHAW. *Mouflon Argali*. DESM.)

Adult male about 3 feet high at the shoulder, and 5 feet in length. Horns nearly 4 feet long, and 14 inches in circumference at the base, situated on the summit of the head, covering the occiput, and nearly touching in front; they bend out backwards and laterally, then forwards and outwards; the base is triangular and the surface wrinkled. The general colour of this species is fulvous grey, and white beneath, with a whitish disk on the buttock. The wool is concealed beneath a close hair. The female is smaller, with wrinkled horns, nearly straight.

This species was confounded by most of the writers of the earlier parts of last century with the Mouflon or European species, before described; and the observations even of Shaw and Pennant are of little available value, in consequence of their having, in some points, amalgamated the accounts of two distinct animals. Gmelin (the traveller) and Pallas have furnished us with the most accurate, as well as the most ample, details of its history and habits.

The argali inhabits the mountains of central Asia, and the elevated steppes of Siberia, from the banks of the Irtisch to Kamschatka. Its flesh and fat are much esteemed in the last named country. The horns are sometimes so large, that young foxes are said to shelter themselves in their cavities. This species is said to breed twice a-year, in spring and autumn. Their motion in running is from side to side like that of the domestic sheep; and whilst making towards the inaccessible grounds, they fre-

* *Voyage en Sibirie*, t. i. p. 368. † *Spicilegia Zoologica*. Fascic. xi. p. 3 tab. i.

quently stop to gaze at their pursuer. Their covering is more like that of a stag than of a sheep, and their strength, activity, and swiftness, also remind one of the former animal. The males fight very fiercely after the manner of the common ram. During the summer months, they dwell chiefly among the alpine valleys, feeding on the younger shoots of a variety of plants. They are then very fat. On the approach of winter, they descend to the lower grounds and feed on grass, and whatever other vegetation is within their reach. They are fond of saline substances, and excavate the ground with a view to obtain salt. In early spring they are much leaner than in autumn. The name of Argali applied to the species by Pallas, is the Mongolic for the female. The male is called Guldshah. It is the Weissarsch of the ancient Germans; and among the modern writers it appears to have been first noticed by Father Rubraquis in the 13th century. He calls it Artak, most likely an erroneous reading for Kirtaka, which, according to Hamilton Smith, is one of its Tartaric names.

Specimens of the heads of Argali have lately been sent to Paris from the Caucasus, by the Count Gamba, consul-general of France at Teflis in Georgia. These indicate the existence of either a strongly-marked variety, or a distinct species. The horns measure $2\frac{1}{2}$ feet in length; and the name of *Ovis longicornis* has on that account been applied to the animal to which they belong. Major Smith had previously remarked a variation in the form and character of the Caucasian race.

4.—THE ROCKY MOUNTAIN SHEEP.

(*Ovis montana*, DESM. RICHARDSON. *Belier sauvage d'Amerique*, GEOR. ST HILAIRE. *Argali* of Cook's Third Voyage, anno 1778, and of Godman's Nat. Hist. The *American Argali*, *Ovis Pygargus*, HAM. SMITH. *Cul blanc* et *Grosse corne* of the Canadian Voyagers. *My-atteht* of the Cree Indians. *Ema-kee-kawnow* of the Pegans, Blood Indians, and Blackfeet.)

When the first mission was established in California, nearly two centuries after the discovery of that country, Fathers Piccolo and De Salvatierra found "two sorts of *deer* that we know nothing of; we call them sheep, because they somewhat resemble ours in make. The first sort is as large as a calf of one or two years old; its head is much like that of a stag, and its

horns, which are very large, are like those of a ram; its tail and hair are speckled, and shorter than a stag's, but its hoof is large, round, and cleft as an ox's. I have eaten of these beasts; their flesh is very tender and delicious. The other sort of sheep, some of which are white, and others black, differ less from ours. They are larger, and have a great deal more wool, which is very good, and easy to be spun and wrought *."

The animal mentioned in the latter part of the above quotation is the Rocky Mountain goat, the other is the Rocky Mountain sheep, or a species closely allied to it †.

This sheep exceeds the Asiatic Argali in size, and is much larger than the largest varieties of the domestic breeds. The horns of the male are very large, arise a short way above the eyes, and occupy almost the whole space between the ears, but do not quite touch each other at their bases. They curve first backwards, then downwards, forwards and upwards, until they form a complete turn, during the whole course of which, they recede from the side of the head in a spiral manner: they diminish in size rapidly towards their points, which are turned upwards. At their bases, and, for a considerable portion of their length, they are three-sided, the anterior or upper side being, as it were, thickened, and projecting obtusely at its union with the two others. This side is marked by transverse furrows, which are less deep the further they are from the skull, and towards the tips the horns are rounded, and but obscurely wrinkled. The furrows extend to the two other sides of the horn, but are there less distinct. The intervals of the furrows swell out, or are rounded.

The ears are of moderate size. The facial line is straight, and the general form of the animal, being intermediate betwixt that of the sheep and stag, is not devoid of elegance. The hair is like that of the reindeer, short, fine, and flexible, in its autumn growth; but, as the winter advances, it becomes coarse, dry, and brittle, though still soft to the touch; it is necessarily erect at this season, from its extreme closeness. The limbs are covered with shorter hairs. In regard to colours, the head, buttock, and posterior part of the abdomen are white; the rest

* *Phil. Trans.* No. 318, p. 232.

† Mr David Douglas, in the *Zoological Journal* for April 1829, describes this species, or variety, under the name of *Ovis Californica*.

of the body, and the neck, are of a pale umbre or dusky wood-brown. A deeper and more lustrous brown prevails on the fore part of the legs. The tail is dark brown, and a narrow brown line, extending from its base, divides the buttock, and unites with the brown colour of the back. The colours reside in the ends of the hair, and, as these are rubbed off during the progress of winter, the tints become paler*. The old rams are almost totally white in spring.

The horns of the female are much smaller, and nearly erect, having but a slight curvature, and an inclination backwards and outwards.

The following are the dimensions of an old Rocky Mountain Ram, killed on the south branch of the Mackenzie, and now in the Zoological Museum (of London) †.

	Feet.	Inches.
Length of the head and body,	6	0
Height at the fore shoulder,	3	5
Length of tail,	0	2
Length of horn, measured along its curvature,	2	10
Circumference of horn, at its base,	1	1
Distance from the tip of one horn to the tip of the other,	2	3

The Rocky Mountain sheep inhabit that lofty chain of mountains in North America from which they derive their name, from its most northern point in latitude 68°, to at least the 40th degree north.

They also, according to Dr Richardson, frequent the elevated and craggy ridges with which the country between that great mountain range and the Pacific is intersected; but they do not appear to have advanced farther to the eastward than the declivity of the Rocky Mountains, nor are they found in any of the hilly tracts nearer to Hudson's Bay. "They collect in flocks consisting of from three to thirty, the young rams and the females herding together during the winter and spring, while

* This process of rubbing seems very influential in producing changes in the aspect both of birds and quadrupeds. Of the former class many owe the gay attire of spring entirely to the cause above alluded to. For example, the blue or slate-coloured head of the chaffinch results simply from the brown points of the winter plumage being worn away in early spring.

† I am indebted for most of the details in this account of the Rocky Mountain sheep to my friend Dr Richardson. The principal figure on plate 23 of *Fauna Boreali-Americana*, is that of the male. I propose, in an early Number of my "Illustrations of Zoology," to represent the fine female specimen now in the Edinburgh Museum.

the old rams form separate flocks, except during the month of December, which is their rutting season. The ewes bring forth in June or July, and then retire with their lambs to the most inaccessible heights. Mr Drummond informs me that in the retired parts of the mountains, where the hunters had seldom penetrated, he found no difficulty in approaching the Rocky Mountain sheep, which there exhibited the simplicity of character so remarkable in the domestic species; but that where they had been often fired at they were exceedingly wild, alarmed their companions on the approach of danger by a hissing noise, and scaled the rocks with a speed and agility that baffled pursuit. He lost several that he had mortally wounded, by their retiring to die amongst the secluded precipices. Their favourite feeding places are grassy knolls skirted by craggy rocks, to which they can retreat when pursued by dogs or wolves. They are accustomed to pay daily visits to certain caves in the mountains that are encrusted with a saline efflorescence, of which they are fond *.

Mr Drummond mentions that the horns of the old rams attain a size so enormous, and curve so much forwards and downwards, that they effectually prevent the animal from feeding on level ground. The flesh of the Rocky Mountain sheep is delicious, exceeding in flavour that of the finest English mutton. We have already mentioned that the inhabitants of Kamschatka highly approve of the Argali in that respect.

The species now under consideration is indeed regarded by some naturalists as synonymous with the last-named animal †. Mr Harlan asserts that no specific distinction exists between them; whilst Dr Richardson, on the other hand, states that there is in the Linnean Society, a good specimen of a sheep from the mountains of Nepaul, which does not appear to differ from the Siberian Argali, but yet seems very distinct from the American one. We probably require a fuller and more precise knowledge of both of these animals before we can come to any very positive conclusion on the subject.

The first satisfactory and renewed notice furnished of this

* *Fauna Boreali-Americana*, p. 273.

† "Il est à croire," says Cuvier, "que le Mouflon d'Amerique (*Ovis montana*) est de l'espece de l'Argali, qui a pu passer la mer sur la glace; ses cornes sont très grosses, et forment mieux la spirale qu'à l'Argali ordinaire." — *Règne Animal*, t. i. p. 277.

animal in recent times, was by a Mr Macgillivray, who described it in the year 1808 *. A specimen presented by that gentleman to the New York Museum, was afterwards transmitted to M. Geoffroy, by whom it was also figured and described †. At a later period, specimens were sent to Philadelphia by Messrs Lewis and Clarke, and these have been represented both by Godman ‡ and Hamilton Smith §. Mr Drummond shot many on the mountains from which the Elk river derives its origin.

The early missionaries who discovered the Rocky Mountain Sheep (supposing the Californian species to be identical with the one above described), characterized it with sufficient correctness, as possessing the hair of a stag and the horns of a ram. It was on the north-west coast of America that Cook obtained the spoils of an animal which the editor of the published voyage considered as those of the Argali. Sir Alexander Mackenzie, in his voyage down the great river which bears his name, received accounts of a quadruped called the “White Buffalo” by the natives of that district; and, during his after journey across the Rocky Mountains, near the sources of the Elk river, he was shown some utensils made of its horns, which he aptly compares to those of the musk ox ||. Both of these animals were, without doubt, the *Ovis montana* ¶.

* *New York Medical Repository*, vol. vi.

† *Annales du Museum*, t. ii. pl. 60.

‡ *Natural History*, vol. ii. p. 329.

§ *Griffith's Animal Kingdom*, vol. iv. p. 318.

¶ *Fauna Boreali-Americana*, p. 272.

¶ In the review of Lewis and Clarke's *American Travels*, in the *Quarterly Review* for January 1815, I observe two passages, which, if not corrected, might lead to an incorrect conclusion regarding the origin of the sheep. “Among the presents which were sent to the President, were some horns of the mountain sheep, called by the Mandans Ahsahta, and by these travellers the Argalia, but more frequently the big-horn, in the usual taste of their nomenclature. Whether it be the *Ovis ammon*, they have given no description which can enable us to decide. It is merely said that the animal is about the size of a small elk or large deer, the horns winding like those of a ram, though larger and thicker. Gass is somewhat more minute; he says they are of a dun colour, except on the belly and round the rump, where they are white; that they have a fine soft hair, and that they very little resemble sheep except in the head, horns, and feet. He speaks of one whose horns were 2 feet long and 4 feet in diameter at the root, and of another pair whose horns weighed 25 pounds the pair. This can hardly be the original of the common sheep; domestication would not have thus diminished the horns, altered the form, and converted the hair into wool; that will probably

We have now presented an abridged view of the principal features in the character and habits of the several races of wild sheep which inhabit the different parts of the world*. That these are one and all specifically distinct, is what, in the present state of our knowledge, we are scarcely entitled very positively to assert: that they are all specifically the same, is, however, much less likely, and by no means accordant with the analogies deduced from the laws which regulate the geographical distribution of animals, and which render it improbable that the same species should occur naturally in all the four quarters of the globe.

be found in another animal, to be mentioned hereafter, of which only the skin has yet been seen by any European."—Vol. xii. p. 334. The other passage alluded to is as follows: "On their way up the river they saw a skin of the mountain sheep, with the horns remaining on it, an interesting circumstance, for no European had ever seen the animal, and the accounts which they had heard of its horns did not agree: these were black, smooth, erect, and pointed, rising from the middle of the forehead a little above the eyes, to the height of four inches. The skin was as large as that of the common deer, and the wool firm, but mixed on the back, particularly on the top of the head, with many long straight hairs. These travellers thought the wool not so long as that of the domestic sheep. Langsdorff, who also saw many of the skins dressed with the wool, for clothing, calls it very long. This, and not the Argali, is, without doubt, the parent of the domestic sheep."—*Loc. cit.* p. 362.

The additional knowledge recently acquired of the history of these North American species, renders it certain that the last named animal has no specific connexion with our domestic sheep. I have already stated, (see note to p. 356), that it is classed by some writers with the goats, and by others with the antelopes. The first quotation refers to the true Rocky Mountain Sheep (*Ovis montana*). The enlightened reviewer, whose information always keeps pace with, and is usually in advance of, what is generally known on such subjects, is himself, I doubt not, by this time fully aware of the state of scientific opinion on these points.

* According to Major H. Smith, the high mountains of Bhootan are frequented by an animal of the sheep kind, which may turn out to be a variety of the Asiatic Argali. "They are known by the name of Nervati, or Wild Sheep of Bhote, and are represented as similar in colour, and in the texture of the hair, to the Chiru, that is a slaty bluish-grey, inclining to red, and concealing, beneath the general superficies, a spare fleece of very soft wool, which lies close to their skin. This colour is probably not unlike that of the Musmon, or a liver-coloured grey; but it may be that the Nervati is of a different species, and even of a different genus, because we have no account of the horns."—*Animal Kingdom*, vol. iv. p. 316.

In the next number of this Journal we shall come to the more practical part of the subject, and present a sketch of the history and characteristic properties of those domestic breeds which man has colonized so extensively, and with such incalculable advantage, over the surface of the earth. This of course is the main point to which our observations lead, and which we propose principally to illustrate; although we hope that the preceding observations may not, in the mean time, be devoid of interest, as exhibiting the natural habits of an animal which is seldom regarded in any other light than as the absolute and exclusive property of the human race.

It is obvious that the longer the period during which any species has been reduced to domestication, and the more complete its subservience to the human race, the greater and more remarkable will be the alterations which it undergoes. We need not, therefore, be surprised that the very ancient dependence of the sheep on man as its lord and master, should have been productive of many signal variations from the character of the original type, and that many anomalous features should have been assumed in consequence of repeated changes of food and climate, and the continuous action of an altered and artificial mode of management. We accordingly find, in the great proportion of our subdued varieties, that the lengthened limbs, and comparatively slender, though strong, active, and graceful forms, have disappeared, and been replaced by heavy proportions, and a consequently indolent disposition; and that the coarse, dry, brittle coating of hair has been succeeded by that woolly substance, of which human industry and ingenuity now form such abundant and manifold materials for the various uses of domestic economy, and the personal comforts of our race. The prodigious development of the wool, and almost entire disappearance of the hair, would indeed of themselves have sufficed to effect a complete alteration in the general aspect and physiognomy of the species; and this remarkable change has been produced in part by physical causes, and in part by the agency of man, who, aiding or counteracting as he best could, the observed tendencies of nature, has contrived to convert a general law of climate to his own individual advantage, thus making all things “work together for good.”

(To be continued in next Number.)

ON THE USES TO WHICH CERTAIN INDIGENOUS PLANTS HAVE
FROM TIME IMMEMORIAL BEEN EMPLOYED IN THE OUTER
HEBRIDES.

HOWEVER much the character of the Scottish Highlanders may suffer when it is compared, as to scientific and literary attainments, with that of their neighbours, we yet find, that, in acuteness of observation, the Celt is by no means behind the Saxon. A Highland peasant, of the present day, is a much better naturalist than a Lowland peasant. The former still participates of his original condition, when the observation of natural objects and phenomena was essential to his existence;—the latter is like a domestic animal let loose in the woods, which knows nothing around it, and is as apt to devour a poisonous plant, as one capable of affording it nourishment. Contrary to the assertion of Dr MacCulloch, who has misunderstood and misrepresented the Highland character, there is hardly a large stone, a remarkable piece of rock, an eminence or hollow, a fountain, rill or pool—not to speak of mountains and glens, lakes, rivers, and arms of the sea—that has not received a characteristic designation, and that is not familiarly known to every inhabitant of the district in which it exists. The natural productions of each place are in like manner familiar to its inhabitants; and from the unlettered cottar of the remote Hebrides I have often received information, clear and copious, respecting a quadruped, a bird, or a plant, for which I should in vain have made application to the zoologists and botanists of the metropolis. The pretensions of the neglected and depreciated remnants of the Scottish Celts to an acquaintance with natural objects, cannot be better established than upon their successful observation of the vegetables indigenous to their country. There can be no doubt that many of our native plants are possessed of qualities similar and equal to those of others which we import, and there can be as little doubt that they are worthy of being investigated. With the view of attracting some attention to this subject, I propose giving a short account of the uses to which certain plants are applied by the

natives of the Outer Hebrides, with whose character and practices a residence of many years among them has made me familiar.

I. *Plants used as Food.*

1. In former times, before the introduction of the potato, and when little corn was grown, the natives were often as much distressed by scarcity of food as they are occasionally at the present day, when their numbers are so much greater. In spring, among other expedients resorted to, they dug up large quantities of the root of the Silver-weed, *Potentilla anserina*. These roots are of an elongated form, about the thickness of a goose's quill, and covered with a brown pellicle. When boiled or roasted, their pulpy substance bears a great resemblance to that of the potato. When collected in quantity, and mashed, they do not seem at all inferior to that root as an article of food. At the present day, these roots are generally picked up by the children, from the newly-turned ground in spring, and frequently in considerable quantities. They are, however, more frequently eaten raw than boiled, being equally palatable in both states.

2. The roots of the Wild Carrot, *Daucus Carota*, a plant which occurs in excessive abundance in the sandy pastures, are also employed as an article of food. They are slender and tapering, somewhat tough, and aromatic, bearing no resemblance to those of the cultivated carrot. They are always eaten raw. The young women collect large quantities of them, for distribution among their acquaintances on Sundays, and at their dances.

3. The young leaves of the Common Nettle, *Urtica dioica*, are often boiled in soup, and in this state form a very palatable article of food.

4. In seasons of great scarcity, the soft stems and leaves of the Field Mustard, *Sinapis arvensis*, are collected in large quantities, and, after being boiled, are eaten with milk.

5. The Cow Parsnip, *Heracleum Sphondylium*, is occasionally eaten as a salad. The young succulent stems alone are used, after being stripped of their envelope.

6. The Charlock, *Raphanus Raphanistrum*, as well as Field Mustard, is used in the same manner.

7. The Common Sorrel, *Rumex Acetosa*, however, is the plant chiefly employed in this manner; and from the quantities which are yearly devoured of it, seems peculiarly grateful to the Hebridians.

8, 9. *Porphyra vulgaris* and *laciniata*, the common brown Laver or Slack, form a regular article of food in March and April. It grows very abundantly, and of large size, on all the rocky shores; and is prepared by boiling for several hours, mixed generally with a small quantity of salt butter; in which state, however, it is not very palatable. Several other species of marine Algæ are occasionally eaten, of which I shall only mention the principal.

10. *Laminaria digitata*, the Common Tangle. The entire portion of the yellowish brown palmated frond is heated over the fire, when it assumes a pale green colour, and becomes tough. It is then rubbed between the hands, till it be limber and soft, and in this state is greatly relished. The young stems are occasionally eaten raw.

11. *Rhodomenia palmata*, the Common Dulse, of which there are several varieties, is eaten both in the raw state, and boiled, like laver.

12. *Alaria esculenta*, the Badderlock, although much relished, is of less importance as an article of food.

II. *Plants chewed or eaten as Luxuries.*

13. The root of the Sea-grass or Grass-wrack, *Zostera marina*, which after storms is cast upon the shores in great abundance and extensively employed as manure, is chewed on account of the saccharine juice which it contains.

14. This is also the case with the tuberous root of the Heath-pea, *Orobis tuberosus*.

15. Where there is a deficiency of tobacco, the islanders console themselves by chewing the root of the Marsh Trefoil, *Menyanthes trifoliata*, which has a bitter and acrid taste.

16. The root of *Ligusticum scoticum*, a plant extremely common in the maritime cliffs, is used in the same manner.

III. Medicinal Plants.

Many species of plants are employed medicinally, but I shall only mention those which are really useful.

17. *Ranunculus Flammula*, Spearwort, a plant possessed of great acrimony, is employed occasionally as an epispastic, for which purpose it is simply bruised upon a hot stone. It generally blisters in from half an hour to an hour; but its operation is much more violent than that of cantharides. There are cases, however, in which, from the celerity of its action, it might be useful.

18. Centaury, *Erythræa Centaurium*, which grows abundantly in the sandy pastures, is collected in autumn in large quantities, and employed as a stomachic, generally, however, in spirits.

19. The root of the Yellow Iris, *Iris Pseud-acorus*, which is extremely acrid, is applied to indolent ulcers, which are of frequent occurrence on the legs and feet.

20. The Wild Thyme, *Thymus Serpyllum*, which is aromatic, is employed in decoction, for dyspepsia.

IV. Plants used for Tanning.

21. The only species used for this purpose is the Common Tormentil, *Tormentilla officinalis*. This plant grows abundantly in the heathy pastures, and its roots are grubbed up with a small forked hook, of which one or more are kept in every hut for the purpose. The roots after being well washed, are mashed with a wooden mallet, and boiled in water. The decoction thus obtained is put into a cask, and the hides are immersed in it, after the hair has been removed from them. The process of depilation is facilitated by immersing the hides in lime water; and as no limestone of good quality has been yet discovered in the Outer Hebrides, the natives are obliged to have recourse to the burning of cockle shells, from which they obtain a sufficiency of lime for the purpose. The decoction of tormentil root is changed several times, and the tanning is completed in about three weeks. The leather thus obtained is only half tanned, and does not keep out water; but the Hebridians generally prefer shoes made of it, which are light, and

better adapted for the country than shoes made of leather better prepared.

V. *Plants used for Dying.*

At the present day, the principal foreign substances which these people employ for dying are indigo, madder and cochineal, the latter in very small quantity. It will be recollected that the Scottish Celts in general have been partial to party-coloured clothing; yet, with the exception of blue and scarlet, all their colours may be produced by their own native plants, and from these they have been in the habit of extracting them.

22. A beautiful permanent yellow is obtained from the Common Ling, *Calluna vulgaris*. Young and juicy plants, or fresh twigs of older ones, are gathered in summer and autumn, and boiled for some hours. In the water employed for this first boiling, a fresh decoction of heath is made, and this repeated three or four times. The wool, yarn, or cloth, to be dyed with this decoction, is previously immersed in a solution of alum. Yellow is not a favourite colour, however, and is only employed in striped cloths, which the women make for their own use; but green, which is obtained by immersing yellow cloth in a solution of indigo, is next to blue the more prevalent colour.

23. Red is a favourite colour, especially among the women, and a variety of it, of a brownish tint, is procured from the root of the Yellow Bedstraw, *Galium verum*. This plant is very abundant in the sandy pastures, attaining there a large size, and sending down roots of great length into the soil. The roots are collected by digging, and after being bruised are boiled. The substance to be dyed is immersed in this decoction.

24. A yellowish brown tint is produced by *Parmelia omphalodes*, *saxatilis*, and several other species of lichen, which are scraped off the rocks, generally with a shell. The mass is then coarsely pounded, and boiled in water. Immersion of the yarn in this water produces a colour, not much esteemed, on account of its dulness.

25. In dying with the above substances, the yarn is previously immersed in a solution of alum; but in dying with indigo,

a decoction of the roots and young leaves of the sheep's sorrel, *Rumex Acetosella*, as well as the common sorrel, is invariably used.

26. Black is procured from different plants. The first of these is the white Water-Lily, *Nymphaea alba*, a plant extremely abundant in the lakes and pools. Its large fleshy roots are procured with much difficulty and some danger, the gatherers supporting themselves on the water with bundles of heath, or of the leaves of the water-lily itself. They are then carefully washed, and cut into thin slices. A decoction of these slices is then made, into which the yarn, previously immersed in a solution of copperas, is laid. The black thus obtained is of an excellent tint.

27. The roots of the common Butter-bur, *Tussilago Petasites*, treated in the same manner, afford the same result.

28. Another plant from which black is obtained is the Meadow-sweet, *Spiraea Ulmaria*, the stems of which are cut with a sickle in July and August. A decoction is made of them in the same manner as of the common heath, from which yarn, previously imbued with alum, derives a dull brownish-black colour.

When it is considered that by such simple treatment, excellent dyes are procured from some of our most common plants, what might not be expected from a chemical investigation of their properties? In Dr Walker's Essays on Natural History, p. 191, it is stated that volatile alkali extracts a fine red colour from *Lichen omphalodes*, not capable of being altered by exposure to the air, nor even by acids, alkalies or alcohol; and that the natives of the Hebrides generally obtain it by macerating the plant in urine. In the Outer Hebrides, however, the yellowish-brown colour which this and other lichens yield, is procured simply by decoction. *Lecanora tartarea* is well known under the name of *Cudbear*, as affording a purplish dye, and has been extensively used for that purpose. *Lecanora Perellus* is similarly used in the South of France; and of the numerous tribe of lichens, doubtless many species would be found upon our rocks and trees, which, by proper investigation, would be found to yield numerous varieties of excellent dyes.

VI. *Plants used for the Manufacture of Utensils.*

29. The Norwegian peasants have been lauded for their dexterity in manufacturing numerous utensils with the aid of no other instrument than a hatchet, a saw, and knife; and the Highland peasant has been represented as deficient in industry and ingenuity, because he has not succeeded in producing the like marvels. But the depreciators of the "ugly black Celt," should have first learned that many districts afford no wood of any kind, upon which he could exercise his ingenuity, and that the drift timber which the Atlantic carries to his shores has invariably been snatched from his hands by the lairds and factors, his kind-hearted and generous patrons. There remain for him but a few grasses and other herbaceous vegetables on which to try his skill. The most important of these is the Sand-bent, *Arundo arenaria*. When cut before the seeds have ripened, the leaves of this grass possess a great degree of tenacity, in consequence of which they have been converted to many important uses.

It is made into ropes of various kinds for the accoutrement of their horses, securing their corn-stacks and thatched roofs, for chair bottoms, and mats and vessels for preparing and holding grain and meal. For the latter purpose, it is slightly twisted; and the different rounds are bound together by the long, slender and very tough roots, which the plant sends into the sand-banks often to the length of twenty feet. Some of the smaller of these vessels are hardly inferior in beauty to those which the Caffres form of better materials. The mats are woven of small ropes in a frame, and are used in the cleaning of grain. Sacks and bags for holding grain, meal, and wool, are made in the same manner. In short, this important plant has been applied to all imaginable purposes. But in future it will be less useful to the poor tenants, owing to the care which the proprietors have begun to take of the sandy pastures; and, in truth, the digging for the roots of this grass and of the *Galium verum*, cannot fail to be productive of much injury to such pastures.

30. Ropes for various purposes are also made of the stalks of *Holcus lanatus*, the meadow soft grass; but they possess little strength.

31. The Fine-leaved Heath, *Erica cinerea*, as well as the Common Heath, are also made into ropes for securing their thatched roofs and corn stalks.

32. This is also, in some places, the case with the Purple Moor-grass, *Melica cærulea*.

VII. *Plants of which articles of Clothing are manufactured.*

The only plant used for this purpose is the sand-bent, of which hats are made in the same manner as meal-vessels. Straw hats of the ordinary kind have never been made in any part of the Outer Hebrides; and the introduction of their manufacture could not fail to be of great benefit to the natives.

VIII. *Plants used for Thatching.*

The huts of the Hebridians are generally ill-constructed, and the thatch is laid on with less care than might be expected in so wet and boisterous a climate, for which, however, they have a reason, such as it is. The fire is always placed in the middle of the floor, there being no chimney, and the smoke spreading along the roof, deposits there an immense quantity of soot, which dangles from the straws in the form of stalactites, occasionally dropping on the floor. The soot thus accumulated is employed as manure, and for the purpose of obtaining it the huts are unroofed in the beginning of May. It is therefore considered unnecessary to bestow much care upon roofing. There is always a great scarcity of fodder for the winter food of their cattle, and for this reason the barley is generally pulled up by the roots. The straws are then cut in the middle upon a sickle stuck in the wall. The upper part is used as fodder, and the lower, with the root, as thatch. Where the yellow iris is abundant, it is cut down for the same purpose, and forms the inner layer of thatch. The outer consists of barley straw, and frequently of heath.

33. In some places, where the Common Reed, *Arundo Phragmites*, abounds, it is cut down for the purpose of thatching, for which it is excellently adapted.

34. This is also occasionally the case with the Common Rush,

Juncus effusus, and other coarse grassy plants, as well as the Meadow-sweet.

35. The Brake, *Pteris aquilina*, is not much employed.

The thatch is held down by coarse ropes made of heath, laid across the roof from side to side, in the loop formed by every two of which is placed a large stone to keep it down, some precaution of which kind is rendered necessary by the frequent occurrence of heavy gales in winter. The thatch is supported internally by smaller ropes made of sea-bent, oat-straw, or other grasses laid across the spars.

The above brief account of the uses to which plants are applied in the Outer Hebrides, if not of much importance in an economical point of view, may at least be amusing to botanists and others; and were it to excite some degree of attention to our native plants, with reference to the uses to which many of them might be applied in the arts, the object of the writer would be attained.

W. M.

ON THE AGRICULTURE OF FRANCE, AND ON THE EFFECTS OF A
DIVISION OF PROPERTY IN LAND. *In a Letter from
Tours.*

I BEGIN to doubt, since I came here, of the soundness of many of our commonly received doctrines in agriculture. Land in this country is divided into very small holdings; a great deal consists of single-plough farms; yet the variety of crops, the attention to gathering manure, to laying the land under crop dry, to weeding, and every process of farming, by no means indicate a bad or slovenly husbandry. Without a long acquaintance with the climate and country, it would be impossible to say whether the methods of cropping in use are or are not judicious; but the indications of careful active farming, as shown in the state of the land and stock, are what a stranger can judge of. Our small farmers at home are notoriously backward and slovenly in their farming; and, in exact proportion to the smallness of their holdings, are they bad farmers. This is so generally true from Orkney to Berwick, that small farms and bad farming are considered inseparable, or rather as cause and

effect. But here I see tracts of country as large as any arable district in Scotland farmed by small proprietors, and evidently as painfully farmed,—houses, yards, live-stock, harness, and utensils, as purpose-like,—green crops, those suitable to the climate, as diligently prepared and laid up for winter use,—as in any average district of Scotland farmed by farmers on a large scale. The division of property among all the children equally must always keep land divided into very small holdings, and the prejudice of the country is altogether in favour of the law. The small proprietors give a kind of garden cultivation to their small patches of land. This gives the fashion to the minute attention to bring every bit of ground into use, and to that best spirit of husbandry which is evidently advancing in France. The sound and prosperous state of the peasantry of this country is best proved by the fact, that a substitute to serve for eight years in the army, which is a respectable and comfortable station in life for a common man compared to our service, cannot be got under L. 80 Sterling; and we recruit men, at present, for life at L. 1, 1s. of bounty, and get so many that we only take men of a certain size and age.

I begin to doubt the excellence of our system of landed property as regards the well-being of the whole population, or the regular production of food for the population. Under our system of law, by which land is held by proprietors and by those under them as tenants, in great masses only, the food must always be exceeding the population, or the population be exceeding the food. Under the French system, of an equal division of land among the children, the growth of food regulates and is the basis of the increase of population. The man whose inheritance of land is too small to grow food for a family, or even to afford a house upon it to hold a family, cannot marry. He, of course, sells his lot to his brothers or neighbours, and the population is, in fact, only increased by those who have food and accommodation for the increase. I begin to think that the French are right in adopting a system which binds the growth of population to the growth of the means of support. It will not end, certainly, in making a nation of squires, but it will end in raising the most equally sustained population in Europe, and

the most free from the extremes of wealth and poverty. And what else would a government be at ?

I am not surprised that the attention of men of observation in our own country, is strongly attracted to the actual effects and probable results in society of the law of succession, the equal division of property among children, in France. Thirty millions of people in the centre of Europe, have adopted a principle for the regulation of property, which is entirely different from, and at variance with, that feudal principle, which regulates property, and is the basis, in fact, of the ideas and feelings, as well as of the laws regulating property, among all the surrounding nations. It is difficult to believe that both systems can go on in harmony together. If the French principle of an equal distribution of property of every kind, among the children of the possessor, be the most equitable and beneficial to society, why should it not ultimately prevail in Europe ? If the feudal principle of the succession of the oldest to the exclusion of the younger children, be the best adapted to the interests of society, by maintaining a due gradation of ranks, and an aristocratical body of landholders, and by opposing a perpetual check to the evil of a redundant population, ought not the principle in operation in France to be extinguished ? Does not the safety of civilized society in every country require that the state of property among these thirty millions of people be assimilated to that of other nations ?

This law is one of the few lasting results of the forty years of revolutions and warfare of France ; and it is undoubtedly the most important and influential for the future state of Europe, of any event affecting property, which has taken place since the subversion of the Roman empire, and the establishment of the feudal system. It is an obscure feeling among the people in France, that the principle on which they hold their property must be a subject of jealousy and suspicion, which occasions the present general ferment and irritation against the Polignac administration. The agitation and alarm are much greater than there is any apparent cause, or any overt act or demonstration of the new ministry, to justify ; and can only be accounted for by this secret but universal feeling in men's minds,

that *all is not over*,—that the principle on which they hold and distribute their property is viewed with distrust by foreign nations, and is submitted to with repugnance by their own rulers*.

With regard to this law of succession, I have heard it observed that it is not a wise one, inasmuch as it compels a man to bequeath his property in land in certain definite proportions, instead of leaving to him the exercise of a just discretion in a matter which affects his own immediate descendants; that it was sufficient, even in a republic, to have abolished the law of primogeniture, but that to compel a man to divide his property at his death, is a departure from the rules of a temperate legislation, and a violation even of natural rights. Now, to the principle of these observations I cannot assent. Man holds property by no such absolute right as is here assumed. It is only under the rules of society, and for the benefit of society, that right of property in any individual to any object he possesses is acknowledged at all. A man has no such absolute right of disposal as is assumed, even of his own actions, which, of all conceivable things, are surely the most absolutely his own. A man, for instance, has a right to throw a stone, but has no right to throw a stone in the direction of his neighbour's head. That simple action even is only his own under the regulations necessary for the preservation or benefit of society: much more is the exclusive right of property in land, or other objects, to which by nature every individual in the society has an equal right, enjoyed and held by any one individual, only under the regulations and conditions necessary for the preservation and benefit of society. If this be the correct view of the principle upon which right of property in indivi-

* By the present law of France, inheritance is regulated by no distinction of the nature, or origin of property,—of sex, or primogeniture. The children succeed equally, although the issue of different marriages. A person cannot bequeath beyond a certain proportion of his property by testament, even to one of his own family. The succession to the remainder is determined by law, and hence there is a compulsory division of property, whether moveable or heritage, on the death of any possessor who leaves more than one child, or when there is more than one person having a legal right to the succession.—Ed.

duals is founded and regulated, it follows that no man has a right to dispose either of his actions or of his property, in a way detrimental to the interests of society ; it follows, that no man has a right to beget children, and leave them at his death to be supported by his neighbours out of their property, while he himself left property sufficient, if fairly divided, to support his own children. We are all ready enough to admit, that persons in a state of such poverty and destitution that they cannot support their children without the aid of the poor's rates, ought not to have married, and have committed, in fact, a fraud upon society, in marrying without being able to support a family ; but we forget that the man is equally culpable, and commits a still greater fraud upon society, who, having property to support his family, bequeaths that property entirely to one of his children, and throws upon society the burden of supporting his other children. Whether they are supported out of a tax called a poor's rate, or are supported out of the assessed and other taxes, constituting the revenue of the society,—whether they are chipping stones on the road-side, or are commanding fleets and armies, or are sitting on the Bench,—there is no difference in the argument, or in the culpability of throwing the support of a man's children entirely upon his neighbours, while he had property sufficient to support them. In both cases, the children are supported entirely at the expense of the society. Whether the employment which society provides for the *pauperism of the rich*, is much more beneficial or necessary than the labour provided for the inmates of the poor-house, may be matter of opinion and doubt ; but it is undeniable, that, whether their services be more or less useful, the expense to society would be less, if their entire support had not been thrown upon society,—if the father had, by law, been compelled to provide, as far as his property could do so, for each of the children he had thought proper to add to the society. The right of interference for the benefit of society in the distribution of property, appears, in the present state of things, undeniable. The expediency of such interference, the wisdom of such a law of division of property among children, must depend upon the effects which its operation is likely to produce upon the wealth, character, and happiness of the population. It is especially necessary

to consider whether its operation does not tend to increase the population beyond the means of a comfortable and civilized existence ; whether it does not tend to such a minute division of the land, that the state of the population is deteriorated, that the habits and usages, the comforts and decencies of civilized life, as they cannot be afforded, are gradually neglected and forgotten, and that the whole mass of society falls back into a condition little removed from that of the animals around them. The peasantry of Ireland, from a similar cause, it is conceived, are reduced to the lowest state to which mankind can be reduced, without losing all claim to be ranked among civilized beings. Is it, or is it not, the tendency of the law of equal division of property, to reduce the country in which it is adopted to the same degraded state ? I shall state the question in the strongest manner. If a proprietor of one hundred acres of land have five children, is it not the immediate effect of this law that each of these children has but twenty acres of land for his support ? As men marry on the smallest as well as on the largest means of support, each of these five children marrying, and having, we shall suppose, five children, the five-and-twenty grandchildren of this proprietor of one hundred acres are reduced to the state of Irish peasantry, living upon the produce of four acres of land each, and possibly marrying, and reducing the next generation to the minimum of food and comfort on which the human animal can exist. I trust this is putting the question and the case fairly. Now, what is the preventive, the counteracting check, to this state of things in the country in which the equal division of property among children is compulsory by law ? It is this—

Avarice is one of the most continuous or constantly operating desires of the human breast. It is the possession of property, the desire of possessing more, the dislike to possessing less, or of dividing or diminishing property, which is the great check upon early or improvident marriages, and upon the undue increase of population. It is the great counteracting check upon the natural tendency to the gratification of the desire of propagation. Remove this check, give a man no property, and he gratifies the sexual appetite by marrying, with as little thought or concern as he gratifies any other natural impulse. Give that

same man L. 100 Sterling, and he will think ten years before making up his mind to diminish his property by incurring the expense of supporting a wife and family. Who are the people who, by early and improvident marriages, augment the mass of the population? Those who have no property, who are labourers or manufacturers, living from day to day, and from hand to mouth; who, if not absolutely on the poor-list of their parish, are but by a single day or a week removed from it. The Irish peasantry, having no property, neither stock nor crop free and unmortgaged for past or current rent, marry and multiply their species, unchecked by the desire of retaining or augmenting. The Scottish farm-servant or cottager, having very generally a little property, the accumulation of his earnings, is restrained from early marriage by this constantly operating desire of acquiring, of keeping together, of not diminishing this property. It is in human nature; and I very much suspect that all moral restraints upon the early and improvident marriages of the lower classes are totally inefficient. The only real restraint upon the desire of propagating their species, among the uneducated part of mankind, is the constantly operating desire to add to or to preserve their property, and the superiority which the possession of property gives them in their own estimation. Look around us, and we see all the excess of population in the abodes of the poor, in the lanes and suburbs of the large cities and manufacturing towns; in a word, among that class who possess no property, and who have no reasonable prospect of ever possessing any. As we advance to the class of people who possess some property, or the certain prospect of possessing some property at a future day, we see no such early or improvident marriages,—we see the check in operation,—we see people considering whether they can afford to marry, and whether their property can support a family,—we see them postponing their marriages until they have acquired sufficient means to support families. Avarice, or, as that word is generally used in a bad sense, we shall borrow a word from the Phrenologist; and call it the Accumulative Propensity, that instinct which leads us to acquire and retain property, and of which even the inferior animals appear to partake, is the only efficient and ever operating check upon the propensity to propagate the species,

and upon the excess of population produced by that propensity in every country and class of men, where it is not restrained by the sense of property. From the state of Ireland, in which the mass of the population has no property, and no check of any kind upon the multiplication of the species, we cannot reason upon the state of France, in which the mass of the population is possessed of property, by the operation of the law of succession, and in which the increase of population is restrained by the sense of property, and by the habits, the wants, and the desires incident to the possession of property. In the former country, there is nothing in the state of property, or of the feelings and habits of the people, to restrain men from propagating as soon as they are led to do so by animal passion. In the latter country, there are all the restraints of the higher classes of civilized society carried down to, and operating with equal force in, the lower classes: there are the love of property, the desire of increasing it and keeping it together, the habit of enjoying certain comforts attached to the possession of it, such as suitable clothing, good houses, cleanliness, amusement, and variety of food. These feelings and habits belong to, and necessarily follow the possession of, property; and act as powerful and constant checks upon early and improvident marriages, independent of the direct and positive check of the accumulative propensity. The law of equal division of property among children carries along with it these checks upon excess of population. It is under the old feudal system of distributing property, by which the mass of the people is left without any of the checks arising from the possession of property, that we find, from the absence of all counteracting checks, a multiplication of the species beyond the means of subsistence. Under the system of an equal division of property, every man, generally speaking, has a portion of property, and a portion of the preventive checks which accompany the possession of property.

Let us look at the subject a little closer. Let us consider whether the distribution of property, on which the character and happiness of a people mainly depend, is more conducive to the well-being of society, under the feudal principle of succession, than under the principle of equal division. The tendency of the feudal principle, is to bring property, especially land,

into large masses. In Scotland there probably are not five thousand proprietors of the land, in which upwards of two millions of people dwell. In Portugal, in Spain, in Russia, in Poland, and in many districts of Germany, the proportion of those who possess property in land is small, in proportion to the number of the inhabitants. The imperfect distribution, however, of the fee-simple of the land, is more or less corrected by the temporary property acquired in the land by leases. Without this distribution of property by leases of the land, it is evident that a country could not remain under the feudal principle. It could not be held in property by a few individuals, to the exclusion of the mass of the inhabitants. In some countries, as in England, Scotland, the Netherlands, and many districts of Germany, the security of property under lease is so perfectly good, and the price paid for that property, viz. the yearly rent covenanted to be paid for its use, is so well proportioned in general to the worth, that, practically, no inconvenience is felt by society from the land not being the property of those who cultivate it.

In Ireland, and perhaps in Russia, Poland, and other countries, this is not the case. The mass of mankind in those countries are suffering, because they have no property. The distribution of a temporary property in the land by leases, takes place at a price or yearly rent too high, in proportion to its yearly worth, to allow the mass of the inhabitants to acquire property of any kind; and even in those countries, such as Scotland, in which the distribution of the land among the inhabitants by leases is regulated in the most safe and equitable manner, there come periods in which the cultivators, as at the present period, are stripped of the whole of their property, and those from whom they had hired the temporary possession of the land, are deprived of the covenanted price or rent. This is not a good state of things. It is impossible perhaps to change it, without tearing up society by the roots. But it is not the better for being unimprovable. The question is, are the people who dwell under this feudal law of succession as well off as a people dwelling under a law of equal division of property among children? I suspect not. People are *well off* in proportion as they possess property, security, and liberty. The

two latter constituents of the well-being of society, viz. security and liberty, may be left out of consideration here altogether ; because they are compatible with either system of distributing property. There can be no doubt that, where property is by law equally divided among the children at the death of the parent, more people will possess property than where the eldest alone succeeds ; and inasmuch as a greater proportion of society possesses property, society will be better off ; but it may be a doubt, if this law of equal succession produces too minute a division of property, whether society would be better off. We may imagine, as in the case above supposed, that the five-and-twenty grandchildren of the proprietor of a hundred acres, having each only four acres of land, may each choose to marry and have five children ; and, consequently, four-fifths of an acre would be all the property which each person of this generation, (only the great grandchildren of the original proprietor of a hundred acres) would have to inherit. It is in this way that many reason against the law of equal succession, and, having got so far, they find no difficulty in proving that no property at all would be better than four-fifths of an acre, or four acres, or even twenty acres, as even this larger quantity, after the expense of building a dwelling-house on it, would only subsist the inheritor of it, in a miserable way, equally injurious to his own interests and to the interests of society. The occupancy of such small patches would clog industry ; and as we see every day, that people who begin with a little fortune seldom thrive in the world, we may conclude that the same want of energy and industry, the same disposition to cling to their bit of land, however minute, would prevent the thriving of the society in which the equal division of property among children is established. In this reasoning there is one little circumstance, of some importance indeed in human affairs, entirely overlooked. It is the circumstance that *man is mortal*. This little circumstance cannot be got the better of ; and, if the world goes on as it has done, the deaths of co-relatives would just equal the births of children. The increase of population, where there are checks in operation upon its excess, is so gradual, or rather stationary, that it may be fairly assumed that the deaths equal the births in all countries, which are nearly peopled up to their re-

sources, and in which property and society are in a sound and prosperous state. America and Ireland are no exceptions. The former is not peopled up to its resources, and in the latter, society is not in a sound state. In both countries population increases rapidly. In America, the desire of acquiring property, the accumulative propensity, is aided by the increase of family. A man marries, because, from the excess of property beyond the population, the services of his wife and family add to his property much more than their support can diminish it. In Ireland, from the total want of property among the lower class, the propensity to propagate is not under any restraint from the sense of property, the accumulative propensity. This latter propensity, as a check on the increase of population, is dormant in Ireland; and in America, as formerly in some of our own manufacturing districts, it is operating in the opposite way. It is there best gratified by aiding, instead of restraining, the propensity to early marriages, and to increasing families. But it may be assumed, that births and deaths nearly balance each other on an average of years, in all countries peopled up to their resources, and in which society is on a sound footing. The quantity of property, therefore, and the numbers of the population, will always bear the same ratio to each other in such countries.

If we set out with the supposition that, in a given country, or district of country, fully peopled, there are ten proprietors of one thousand acres each, ten of one hundred acres, ten of twenty acres each, and so on, we should find that, taking the births by which, under the law of equal division of property among children, these properties would have a tendency to be subdivided, and taking the deaths by which these properties would have a tendency to be re-united by inheritance, the one would balance the other, and the distribution of property in that country or district would be the same after a series of years as at first. Supposing one proprietor of one hundred acres, with his five children, his five-and-twenty grandchildren, and his one hundred and twenty-five great-grandchildren, each of whom would only inherit four-fifths of an acre of the original one hundred acres, to be not a family of immortals, we shall find, that if one half of mankind die before attaining the age of twelve,—that if the ave-

rage of human life be under thirty years, and the average age at which men marry about the same, and that a large proportion of women never marry or never have children,—if we could combine these and other data, which perhaps are rather subjects of experience than of calculation, we should find that the probability is, that the hundred acres of this proprietor would, in the days of his great-grandchildren, be reunited by inheritance and held by one proprietor instead of by one hundred and twenty-five, and that it had never been much subdivided in the interval *.

* This principle, we apprehend, must be received under certain limitations. If, of thirty millions of people, three millions now possess property in land, it does not follow that in another generation or more, only three millions out of thirty millions will possess property in land. Granting the deaths to bear such a ratio to the births as to preserve the population stationary, still land, like gold and silver, may tend to pass by inheritance and subdivision, to a greater proportion of the population, than three millions out of thirty millions. The principle laid down by our excellent correspondent can only be strictly true when every person of these thirty millions possesses property in land; then, indeed, if the population be stationary, there can be no subdivision of this land into more than this number of shares. The principle, however, is with certain limitations just. Only a given number of the population of a country can, from the nature of land itself, or will, from the diversity of men's pursuits in society, become husbandmen or owners of land. Land, therefore, will tend to a subdivision, not amongst the entire population, but amongst a given proportion of it. Whether this maximum of division has yet taken place in France, can only be known after the lapse of generations. It is rather to be believed that the law has not yet been sufficiently long in operation to have produced this maximum of division. As to the fear of an *indefinite* division, this we conceive to be groundless. Not only is this tendency to subdivide checked in practice by considerations of expediency—as by brothers and sisters uniting to preserve an estate by arrangements with the elder inheritor, by sales, &c.—but it is subject in its operation to a controlling principle—namely, that in a community, a limited portion of the population only can, from the nature of things, be possessors or owners of land, and that, therefore, it is amongst a given number only that land will or can be divided. It would require an Agrarian law for every generation to make the result otherwise. The law of equal succession, we may observe, is extremely popular in France, even amongst the most enlightened classes; and any attempt on the part of the reigning family to interfere with it by restoring the law of primogeniture, has been met by the strongest manifestations of public dislike. The law is indeed well suited to prevent what is so much dreaded in that country—the restoration of the ancient régime; because it presents a barrier to the establishment of a feudal aristocracy. Whether it

For these and other reasons, I am of a different opinion from many on this subject ; and do not think that a law of equal division of property among children would or does produce an excess of population, or too minute a division of land for the well-being of society. It is true it would prevent the excessive accumulation of land in the hands of a few families, it would keep up, if I may so speak, an equal *temperature* in society, by bringing all in turn to the surface, and by circulating the influence of property from the bottom to the top ; but that would be far from being detrimental to the character, wealth, and happiness of a nation.

ON THE ACCIDENTAL INJURIES OF THE FOOT OF THE HORSE
ARISING FROM SHOEING, WITH THEIR EFFECTS AND TREAT-
MENT. *By Mr WILLIAM DICK, Veterinary Surgeon, Edinburgh. In a Letter to the Editor.*

SIR,

HAVING on a former occasion offered some remarks on one of the most obscure diseases to which the foot of the horse is liable, I now trouble you with a few observations on the more common and obvious injuries arising from shoeing.

From the plan which is necessarily adopted of affixing the shoe to the foot by driving nails through a portion of the hoof, and from the small space which the structure of the hoof allows for the nails to pass through without injuring the quick (the sensible part of the foot),—from the many accidental circumstances connected with such an operation, and the frequency

presents an equally secure barrier against military despotism has been questioned by many, while to others it seems an institution better suited to a republic than to a monarchy, in which it leaves nothing in the form of a landed aristocracy as a counterpoise between the prince and the people. Be this as it may, the operation of the law hitherto appears to have been eminently favourable to the happiness of a great mass of the population of France. As regards its effects on population, the ingenious reasoning of our correspondent seems to be borne out by the result, that, with greater indications of solid prosperity, the population of France is increasing more slowly than in most of the countries around it.—EDIT.

of its repetition,—it must be expected that in some cases, by a carelessness, or an accidental eccentricity of direction in driving the nails, some of them may enter into and wound the quick ; which accident, when it does occur, is denominated *pricking*. Although I do not intend to enter into a defence of the carelessness of shoeing-smiths, I cannot help remarking, that when we reflect on the frequent repetition of the operation of shoeing, the number of nails driven into each shoe, and the small portion of horn through which the nails must pass (say three-eighths of an inch in thickness), we cannot but be astonished that this accident so seldom occurs. In many cases, no doubt, where the injury is slight, no bad effects follow, and the injury may be unknown ; but it more commonly happens, that where a puncture has been inflicted inflammation is produced, which, running through a variety of stages, destroys a greater or less portion of the foot, according to its severity, or the treatment adopted, and renders the animal for a considerable time unfit for use.

A simple puncture with a nail, if at first attended to, is a matter, comparatively speaking, of little consequence ; but the effects which rapidly follow both this and many other, at first trifling injuries, are frequently of the most serious consequences.

In every instance where the quick is irritated by a foreign body, and that irritation kept up, or where it is sufficient at first to excite suppurative inflammation (a formation of matter or an abscess), unless it is detected in an early stage of its progress, and a proper opening made to allow the escape of the matter immediately after it has been formed, it will almost invariably be found that the suppuration will continue to increase, and, as it cannot open a way for itself through the hoof, it will pass up to the coronet, detaching the hoof in proportion to the degree of the inflammation which has been set up. In some instances, this may be comparatively slight and to small extent, but more commonly it is violent, and produces the most destructive effects in the part which it has attacked, causing extensive sloughings of the coronet, and, in some extreme cases, extending until it has produced even a detachment of the whole hoof.

Suppuration within the hoof may be produced, not only by wounds with nails in shoeing, but by wounds from sharp stones

or other bodies on rough roads. It may also arise from bruises, corns, sandcracks, treads, overreaches, and what is sometimes called a seedy toe. In all these cases effects are produced similar to what I have mentioned in punctures with nails; matter is formed within the hoof, which must be allowed at once freely to escape, otherwise the suppurative inflammation extends throughout the whole foot, producing complete destruction, permanent lameness, or a quittor. In every instance (except in unnerved horses) where suppuration takes place in the foot, great and acute pain is soon evinced, and this continues until the matter escapes at the coronet, or the wound has been opened through the horn. But the difficulty, in most cases, consists in discovering the seat and nature of the complaint.

The various causes from which suppuration may arise, are, to those unaccustomed with the examination of the foot, so little known, that the lameness is commonly referred to some other part; a violent strain, it is perhaps thought, must be the cause of it, because it has come on suddenly, and because the leg has become swollen; but these are common occurrences in the kind of injuries of which we are treating, and cannot be mistaken without incurring the danger of irreparable mischief. The lameness may be sudden, because the wound may arise from picking up a nail, or from treading upon the corner of a stone and wounding the sole: it may arise from a corn, or from accidentally treading with increased force upon a part already inflamed by having been previously wounded by a nail, perhaps from an accidental twist or displacement given to the shoe, or it may arise from the sudden occurrence of sandcrack, a tread, or an overreach. In such cases, unless there appears an obvious wound, the chances are that the lameness is referred to some obscure situation, such as the shoulder, the hip-joint, or the back sinews, and these parts are incessantly besmeared with ointments, until the mistake is discovered by the appearance of a collection of matter between the hair and hoof. The seat of the disease is then discovered when too late, and instead of being able to check its progress and restore the animal to soundness in a few hours, as many weeks or months will, in all probability, be required.

When matter forms within the hoof, the lameness frequently comes on very suddenly, and is in such cases brought on by some accidental cause, as before described. It is commonly followed by a degree of swelling in the limb, attended with pain, produced by the inflammation having extended along the absorbent vessels, together with a general increase of the determination of the blood to the limb, which, both from the appearance and situation of the swelling, is generally mistaken for a sprain; and which frequently misleads the unwary by which they overlook the cause in the effect, until the time of cure has gone by, and months are lost, if not the animal.

If, then, so much danger arises from overlooking the diseases of the foot, would it not be a wise precaution, in every instance where lameness occurs, to have the foot immediately and carefully examined? And I would even recommend that not only one examination of the foot should take place, but that those who are not gifted with the "second sight" should repeat it, even where the cause of lameness may as obviously exist in the leg, as if a fracture had taken place. Lameness from injuries of the foot, in its progress exhibits such a variety of symptoms, as to pain, movements of the limb, &c. that, without the precaution I have given, mistakes must happen, and these too serious ones.

If, then, the disease is known to exist in the foot, it may be expected that the particular part will be easily discovered; but this is not always the case, and the greater caution is therefore necessary. In examining the foot, attention must be paid to the general bearing of the shoe, the extent of the hold of the nails, the regularity of the holds, and situation as to the strength of the hoof, the various modifications of the form of the hoof, and the temperature of it. By attention to these particulars, the seat of the injury may often be discovered; but these alone are not to be considered sufficient to determine the absence of disease in the foot,—the shoe must be removed, the hoof pared when it is possessed of much strength, and a degree of pressure firmly made by means of the pincers, pressing the foot from the one heel round by the toe to the other, making the sole of the hoof yield at every pressure that is given; and if, in this way, the foot is examined, the sore part can scarcely escape notice; the

animal will draw away his foot from the pressure, the moment it is applied to the inflamed part. But lest in strong feet the hoof should withstand by its strength the pressure of the pincers, the hoof must then be further pared, and the examination repeated; or it may be gently taped round the crust with a hammer, while the horse is standing carelessly at rest upon a flat surface, and in this case he will give way, when the hammer has tapped upon the exterior of the sore part, if any such exist in the foot.

Having thus ascertained the situation of the injury, a dependent opening must be made, by following the trace of the injury with a drawing knife, until the matter is allowed to escape; the same treatment must be followed, whatever may be the cause from which it has originated. It may truly be said, in this case, that a knowledge of the disease is half the cure; for having once discovered its seat, in the early stage of the disease, the treatment is extremely simple; all that is generally required to be done, is merely to soothe the parts, and allay the irritation which has been produced, by the removal of the detached horn, and the application of a few bran or porridge poultices, and the parts will soon restate themselves. It must, however, be remarked, that much depends upon the removal of every source of irritation in cases such as have been alluded to; for, unless the detached horn is carefully removed or well relieved from the diseased part, and also the sand and gravel which commonly are found in it, there is much danger of the disease extending, and sinuses or quitters forming, which prove in every instance of a troublesome nature.

I therefore repeat, that it is of the first importance, in every instance where lameness occurs, to have the foot carefully and repeatedly examined. It is from a neglect of these precautions that quitters, and diseases of that kind, are so common amongst agricultural and other draught horses.

Having allayed the inflammation consequent upon a wound from a nail or any other cause, by the application of poultices repeated every night and morning, a dressing of melted tar with tow is commonly applied, which rapidly encourages a secretion of horn, and a few such dressings will put all to rights.

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Some prefer dressing the wound with tincture of myrrh, or that combined with aloes; while others prefer dressing the part with some caustic, to "keep down the proud flesh." Now, while I must confess, that, in some cases, escharotics are of service in healing up these wounds, I must also observe, that it is, generally speaking, overcoming the disease by force, instead of science; and that, in all cases, the appearance of *proud flesh* springing up is almost a certain symptom that the cause of irritation has not been completely removed. This cause may arise from a small portion of the hoof having become partially detached, in consequence of the inflammation of the part; for I must here remark, that, when any portion of the hoof has been detached by inflammation and suppuration, it then becomes as a foreign body, and proves a source of irritation to the sensible part, with which it was formerly in harmonious union. The irritation in such cases is materially increased, and kept up by the enlargement, which always arises from inflammation and increased determination of blood to any part; but in the foot, the evil is doubly increased, by the circumstance of the sensible foot, with its extreme vascularity, being completely enclosed within the insensible hoof,—a part governed by different laws from the parts which it encloses.

We know that where a part is inflamed, it swells by the increased determination of blood to it, and that pain is materially increased by any degree of pressure. In the foot, when inflammation occurs, the small comparative degree of elasticity which exists in the hoof is insufficient to allow of the necessary degree of expansion, and the parts within are violently compressed; thus the excruciating pain which is evinced by an animal suffering from such a disease is accounted for. The hoof must therefore be well opened, and thinned, or altogether removed from the part affected, in every case where violent inflammation of the foot exists. Where these means are not sufficiently adopted, or where they are not carried into effect with sufficient decision, the suppuration extends upwards, detaching the coronary ligament from the parts with which it is immediately joined, and matter is formed under it, which by rapidly extending around the foot, soon produces most extensive destruc-

tion. To check the progress of suppuration, when it is detaching the coronary ligament, we must at once make an opening or two with the lancet in a vertical direction, so as to allow the matter to escape, which, from the time commonly required for the suppurative process being completed in such parts as those to which we allude, it seldom of itself does, without extending and thereby doing great mischief. Where matter has been thus formed at the coronet, and allowed to escape, the causes of the inflammation removed, and proper attention paid to the application of poultices, in which some mild astringent wash has been mixed, the parts gradually heal up, and soon get well; but unless great care has been taken, troublesome sinus ulcers form, which extend in various directions, and the disease is then designated a Quittor.

When these sinuses have formed, they commonly prove troublesome to heal, and if a country farrier accidentally succeeds in the treatment of such a case, he is at once supposed to be at the head of his profession, is dubbed "the Doctor" by his employers, and licensed by common consent to cut and carve at pleasure. From the variety of structures that are involved in this affection, considerable discrimination is necessary to treat the disease upon scientific principles. The close connexion of the hoof with the vascular secreting surface, the laminae, the coronary ligament, the cartilages, ligaments, bones and joints, render such diseases at once obstinate, requiring the most accurate knowledge of the parts for their scientific treatment. There are several methods adopted for the cure of quittor, The first and oldest practice is that of curing out the diseased parts, and reducing the whole to one continued healthy surface, and afterwards treating the sore as a simple wound; the second, of at once extirpating the diseased parts by excision; and the third, by exciting healthy action in the ulcers, and promoting adhesion. The first and oldest practice is that usually adopted by farriers, and is effected commonly by the actual cautery, or the most active caustics, or both combined.

The wounds are filled by forcing in with a probe a large portion of corrosive sublimate, arsenic, lunar caustic, sulphate of copper, or the acetate of copper; or they are injected with a syringe, with the muriate of antimony, the sulphuric, ni-

trix, or muriatic acids, to *core* out the quitter. And when these fail, the dose is repeated, the enlarged substance on the coronet is bored with a hot iron, and the caustic introduced, by means of which greater portions of it are detached, and a large sore produced requiring a great length of time to heal; and in every instance, even when it does succeed, producing a great derangement of the secretion of hoof, with a weakness or fissure of the crust, which is denominated false quarter.

This defect is mainly owing to the extent to which this coring treatment is carried. Farriers are not content with simply producing a new surface in the wound itself, but having perhaps in some cases found a small portion of bone, which has been thrown off by exfoliation in the progress of the disease, they are led to suppose that the same is necessary in every instance, and that they must not only *core* out the quitter, but likewise the quitter bone*.

They are therefore in the habit of protracting the cure by repeating the application of the caustic, until part of the coronary ligament is destroyed and altered in its structure; the consequence of which is a diseased secretion; the ligament having been destroyed and divided by these caustics, the hoof which is secreted and formed by it is, as a necessary consequence, divided also, and grows down a false quarter. Caution is therefore necessary in the use of caustics. They ought to be adopted as seldom as possible, and I am inclined to think, that with patience most cases would be found to submit to milder means than that commonly adopted: the caustic ought to be the last instead of the first remedy. What, then, is to be done with quitter, the farriers will say? Why, in the first place, relieve the sensible parts as much as necessary by thinning away the hoof as completely as possible, taking care at the same time to avoid giving fresh wounds to sound parts in the course of the operation; see that no sharp corner or edge of hoof is allowed to remain pressing into and confining a portion of the soft parts.

In the next place, examine the sinuses, and ascertain if the orifice is dependent; or whether any foreign body, as a little gravel, a piece of wood, a portion of exfoliated bone or cartilage, liga-

* The cored out part is generally supposed to be the quitter, but is nothing but a portion of the quirk that has been destroyed by the caustic.

ment, or lymph, is not lodged in some part or cavity of the sinuses, and keeping up the discharge; and having ascertained that these circumstances do not operate in keeping up the disease, then try what can be effected, not by coring out and destroying the parts, but by exciting a fresh action in them. Let a solution of any of the solid caustics above enumerated, or some of the liquid ones in a diluted state, be injected into the very bottom of the sinuses, and this repeated every day until what is called adhesive inflammation is set up, and the wound will soon close. Setons are also used with the same view, and, when kept in the part for a few days, often do good. Escharotics, as sulphate of zinc or alum, may be introduced in the solid form into the ulcers with the same view; and the first will be found in many cases, where the inflammation is not very active, to heal up the wounds in a very few days, if it has been properly introduced into the bottom of the wound. The same happy result will often follow a continuation of careful and complete injections of a solution of some of the caustics. Saturated solutions in water of the sulphate of zinc or copper, or the oxy-muriate of mercury, has commonly the best effect; but in old and obstinate cases, their effect may be materially increased for the better, by the application of a blister over the swelled part, repeating it as occasion requires; but instead of requiring in general the aid of blisters to excite the inflammation, there is more commonly too much set up by the injections, and a poultice is therefore rather required to mitigate the inflammation and assuage the pain. Indeed, mild as the injection of caustic in a diluted state is, when compared with the introduction of it in the solid form, as farriers are commonly in the habit of using it, this treatment is often more powerful than is required. The wounds may frequently be healed by simply removing that portion of the hoof which presses upon it, making a dependant orifice, and soothing the whole by a continuation of poultices; and even where it may be found that caustic must be employed in the solid form, or where recourse must be had to excision with the knife, the application of poultices continued will materially assist in allaying the irritation arising from the application of such remedies, and contribute much in preventing their bad effects.

The removal of the diseased parts with the knife cannot be much recommended ; the knife should only be used in old cases, and then too only where all the diseased parts can be completely removed without much destruction to the foot. In some instances I have seen a good cure effected by this method, but it is only in favourable cases that it should be tried. I am a strong advocate for mild measures in veterinary practice ; our object must be a restoration of parts, their removal is not for us. I am, &c.

ON THE CURE OF HYDATIDS, OR STURDY, IN SHEEP, BY TRE-
PANNING. *In a Letter to the Editor.*

SIR,

THE following instance of an effectual cure of the disease in sheep, commonly called Sturdy, by means of trepanning, though not a new mode of cure, may be interesting to some of your readers.

I had a gimmer of the Leicester breed, which had been brought up as a pet about the house, on cow's milk *, its mother having died after giving birth to twins, one of which was brought up by another ewe. The shepherd dreaded, at the tupping season, that the gimmer would become affected with sturdy. The symptoms of the disease, however, did not become aggravated till February, when the poor creature wandered from the rest of the flock, stood up against the fence, or fell into the ditches, though it never lay on its back. It then ceased to be able to gather its food, and would certainly have been killed long before it was reduced to such a pitiable state, had it not been from the desire of saving the lives of the twins, with which it was evident it was pregnant. After all, the twins were

* A goose-quill, covered with linen cloth sewed on with thread till it acquires the thickness of a ewe's teat, I have found a very useful instrument with which to give pet lambs their milk, which should be warm from the cow. This artificial teat should be washed clean every time it is used, which should be, at the least, three times a-day, to prevent its contracting acidity.

produced about a fortnight before their due time, and were both dead. As the mother would have died in a short time also, a victim to the disease, the experiment of trepanning was tried without diffidence. The part affected was on the forehead, about half way between the left eye and the spot where the horn would have been, and the skull over the part was so soft that a very slight pressure of the thumb was only necessary to depress it. The sheep was set upright on its rump, and I cut round the soft part with a sharp knife pointed like a pruning-knife, the circle enclosing a space larger than a shilling. A small piece of the skull was left to act like a hinge to the piece thus cut round. This part of the skull, with the skin and hair upon it, was lifted up like a lid, so as distinctly to show the hydatid, having the appearance of a bag containing water*. But, large as the incision was, it was not large enough to admit of the hydatid being taken out entire. Indeed, the skin of it was so very tender, that I doubt whether it could have been taken out entire. At all events, it broke in the removing, and contained a large quantity of warm limpid fluid, which ran down the face without interruption, and literally poured over the nose for some seconds. After being satisfied that all the fluid was absorbed by a sponge, I put a plaster of common tar on a piece of soft leather over the wound, and covered the upper part of the head with a stout linen cap, firmly secured with strings round the neck and below the jaw-bones. So immediate was the good effect of the operation, that the eyes of the animal, which were before almost turned round in the socket, resumed their natural position and appearance. The creature was confined for a few days in a small shed which was erected for sheltering ewes that were lambing at night, and fed

* This globular substance, which frequently gives the name of "Water in the Head" to this disease, is known to be an animal. By what means it finds its way to the brain is not known. It is also found in other parts of the body, as in the liver and spleen. In swine and dogs it is very common in these organs. It is either found in the ventricles, or at the surface of the brain. In the latter case, a softness of the skull is discernible, and is generally on the opposite side to that on which the animal holds its head. But this softness of the skull is not discernible when the disease is in the ventricle.

on greens, of which it soon got very fond. It was put out to the new grass along with the first of the ewes that went with their lambs, and soon perfectly recovered, its cap getting leave to remain on its head all summer for fear of the flies. It bore lambs, twins each time, for two seasons after the operation; and, when afterwards sold, it was one of the heaviest and fattest in the lot.

I would now have no hesitation to attempt a similar operation under the like circumstances, and I certainly do think the trepanning a surer method of cure, when the skull indicates a softness in any part of it, than the thrusting a wire up the nostril, through which it can be directed only at random. If, however, the hydatid is situated in the ventricle, or anterior part of the brain, a wire reaches it more readily in this direction than in any other. I am, &c.

S.

ON THE TALA PLANT AS A SUBSTITUTE FOR THORN IN HEDGES.

Communicated by the Right Honourable SIR JOHN SINCLAIR, Baronet. In a Letter to the Editor.

SIR,

MY attention was some time ago directed to a South American plant, which, from the properties it was represented to possess, seemed calculated to supply the thorn of our common hedges. Having requested a more particular account of it from the intelligent gentleman to whom I was first indebted for my information on the subject, I have the pleasure of transmitting to you his letter, which, I trust, will prove interesting to the readers of your Journal, not only as making us acquainted with the uses of a plant which may perhaps form the subject of cultivation at home, but as apprizing us of the extent to which the colonization of our countrymen has taken place in the South American States. While, in one sense, it is gratifying to observe the extension of the useful arts by the prodigious facilities now afforded of communication with the most distant regions, it affords us some subject of melancholy reflection, that

so many of our industrious countrymen should be forced, by the want of employment at home, to become the subjects of a foreign state, and thus to carry those abilities, and that capital and spirit of enterprize, to other countries which might have been employed so happily in their own. I remain, &c.

“ I have much pleasure in sending you, as you requested, some particulars regarding the Tala hedges which have proved such useful fences in the hands of some of our intelligent countrymen settled in Buenos Ayres. My attention was particularly directed to them a short time before leaving that country in May 1828, it being then the commencement of the winter months in that part of the world. I had been induced to pay two visits to Monte Grande, distant about fifteen miles from Buenos Ayres, where upwards of 300 Scotch farmers had been settled and occupied in agricultural pursuits during three years, and had then in their employ, principally as labourers, more than 200 natives of the country, many of whom had become acquainted with the improved method of farming followed there by our countrymen ; who, by judiciously engrafting on the modes of husbandry practised in the country, such of the rules to which they had been previously accustomed in their own country, as seemed best suited to the climate and circumstances of their new situation, had already given to that district an interest and importance which had never before been witnessed in that part of the world.

“ On these occasions I was particularly struck with the efficiency of the hedges which in some places had been formed and rendered useful in the few years during which they had been there ; and to the inquiries I then made, I obtained the following particulars: That on their first arrival they were so ill pleased with the fences in use at Buenos Ayres, which are formed of Tuna (*Cactus peruvianus*) and the American aloe, which, with other defects, harbour vermin of all kinds, that they resolved to try something else, more analogous to the hedges they had been accustomed to in Scotland. They selected for this purpose the Tala, a small thorny shrub, growing wild in various parts of the country. This they planted in rows, and treated nearly in the same manner as is usually practised with thorn

hedges, and the experience of three years had been amply sufficient to establish the merits of Tala hedges as an excellent fence for all purposes for which they required it. Those which had been first formed and had been sufficiently cared for, were then, I was informed, sufficient to prevent any animal from passing either out or into their fields, and possessed the additional recommendation of not being liable to injury by the ants or any other insect.

“ The same method of forming these Tala hedges which had at first been tried, was then generally followed throughout the settlement, and was as follows:—A ditch of sufficient dimensions to serve as a fence during the first years, was formed round the ground to be enclosed, the earth being thrown up so as to form a mound along the inside. Along this mound the Tala plants were placed at regular distances, and great attention paid to remedy any deficiencies or accidents, the whole being clipped at stated periods, so as to spread most in the direction required. It had not been found requisite to clear out the ditches after they had been first formed, as it was found that the tala plants had grown sufficiently high to serve the purpose of a fence, before the ditches had become comparatively useless in consequence of their filling up by vegetation.

“ Although I am somewhat doubtful whether the Tala plant will flourish in this country, or at least with such luxuriance as it does at Buenos Ayres, where the sun is so much more powerful, yet it certainly merits a trial being made, for which purpose a sufficient supply of tala berries and young plants might be procured at Buenos Ayres, and if carefully put up by some of the Scottish gardeners residing there, and forwarded to Liverpool, it is probable a large proportion would arrive in a good state; although perhaps the proper season for collecting the berries this year may have passed before any letter could reach Buenos Ayres, yet it would be the best time for procuring young plants and sending them to Europe.”

ON ECONOMY IN PLANTING.

1. *The Practical Planter ; containing Directions for the Planting of Waste Lands, and Management of Wood.* By THOMAS CRUIKSHANK, Forester at Careston. 1830.
2. *A Memoir addressed to the Society for the Encouragement of Arts, Manufactures, and Commerce, on the Planting and Rearing of Forest Trees, demonstrating the necessity of trenching the ground previously to planting, and of keeping it clean afterwards ; and proving, from actual experiments, the powerful and profitable effect of Manure in promoting the Growth of Trees.* By WILLIAM WITHERS jun. 1826.
3. *A Profit and Loss View of planting One Acre of Land on the System recommended by Mr Withers, and that generally adopted by Scotch Planters.* 1827.
4. *A Letter to Sir Walter Scott, Bart. exposing certain Fundamental Errors in his Essay on Planting published in the Quarterly Review, and containing Observations on the Pruning and Thinning of Woods, and Maxims for Profitable Planting.* By WILLIAM WITHERS jun.
5. *A Letter to Sir Henry Stuart, Bart. on the Improvement in the Quality of Timber, to be effected by the high cultivation and quick growth of Forest Trees.* By W. WITHERS.

THE planter has been characterized as the most disinterested of mortals, because he labours for posterity ; but his claim to this distinction may well be questioned. Like every one who labours from choice, the planter finds gratification in his pursuit. The little tree which he puts into the earth very quickly becomes a feature in the rural landscape, and thus the taste is gratified almost as soon as the labour is done. In a few years more, his woods afford shelter from the winds, and thus not only increase the beauty, but the value, of the lands around them ; while it is rarely beyond the usual expectation of human life, to look for a direct profit from the thinning of the wood in its progress to maturity. To expend capital on planting, indeed,

is merely to lay out a fund to increase at interest, and often at a high rate of interest. Let it be supposed that a wood requires sixty years to reach the age of good timber, that the land is worth 5s. per acre, in its original state, and that the expense of planting and enclosing it is L. 5 the acre. Then, rating money at 5 per cent., and supposing it to increase at compound interest, the amount of L. 5, principal and interest, will be found, by calculation, to be - - - - L. 98 7 11

And the amount of the supposed yearly rent, 5s.,

for the same period, - - - - 68 7 11

L. 181 15 10

So that, if the wood should be worth L. 181 : 15 : 10, at the end of sixty years, the original capital will have been laid out at 5 per cent. compound interest. But L. 181 : 15 : 10 per acre would be considered by planters as a very low price of wood, even of the least valuable kinds, of sixty years standing. Besides, that sum would not show the whole direct profit derived ; for there would be the farther produce of the thinning of the wood, until the time of cutting the whole down.

It appears, then, that planting is really a means, in the hand of a landed proprietor, of setting aside a fund for any specific purpose—as for a provision for his family ; and no man is deemed peculiarly disinterested who merely obeys a law of reason and humanity, and provides for his immediate descendants. The planter, then, has motives of rational interest sufficient to justify him in the eyes of the worldly minded. He lays out his capital with the view to a profitable return ; while, in the practice of his creative art, he finds the materials of an innocent recreation. It may be questioned whether, in the whole range of rural occupation, one more interesting presents itself, than the superintendence of a growing wood, which offers to the eye, at every season, new features, and new objects of interest and solicitude.

In this island, where seas have for ages rolled between its inhabitants and invading enemies, the happy security of property, and the wealth and taste of the people, have long given to the culture of trees a place amongst the favoured arts. In England, not only the noble parks studded with wood which

every where abound, but the infinite variety of graceful trees, planted in hedge-rows, or standing alone or in groups in the meadows and cultivated fields, give a rich peculiarity to the landscape which is to be found in no other country; and, when we consider the prodigious value of these masses of timber, which are suffered by their owners to stand for generations, untouched by the hatchet, we must see how much of the passion of the English for trees is founded on taste rather than on considerations of gain. This taste, associated as it is with the many feelings of enjoyment which the possession of trees affords, doubtless proves a more powerful, as well as a more frequent, incentive to planting, than any considerations of utility or distant profit. And yet utility and profit must not, and need not, be disregarded in the creation of the infant forest, or even in establishing the solitary tree; and, happily for the progress of this delightful art, the useful and the ornamental touch at so many points, that the cases are rare where they really diverge. If the gratification of taste only shall be regarded in planting, still it must be held to be important, as a means of extending the culture of wood, that the object of desire shall be easily obtained, and placed within the reach of many. If, on the other hand, utility and profit shall be chiefly looked to, then, as in all the other branches of rural economy, the more simple and economical the means are by which we are enabled to accomplish our purpose, the more perfect may our practice of the art be considered. It is not enough to produce timber, any more than it would be to produce wheat, or barley, or rye. Unless the labour and capital employed shall be economized with relation to the produce to be returned, the full measure of public and private benefit is not attained, and a want of skill in his art is displayed by the operator. That indeed is not the true economy which looks merely to the saving of present cost, without reference to the ultimate gain; and yet the saving of present outlay in planting, is of itself a very important object, even although a less comparative ultimate return should be received. One of the first considerations in planting the barren parts of our alpine districts, will generally be the pecuniary sacrifice necessary to effect the purpose. To enhance expense, then, is to lessen or take away the inducement to plant in all

those parts of the kingdom where the greatest benefit is to be derived from wood. And, when we reflect for a moment on the vast importance of covering the more desolate districts of these islands with so rich a produce, we must see how great the error would be of disregarding economy in the practice.

These remarks we make with a special reference to the opinions advocated in the works on planting quoted at the head of our paper. The first of these presents us with a concise and distinct detail of the practice of planting on a system where the utmost economy of capital and labour is studied. The others present us with the opinion of their author on the system more generally approved of by English planters, of preparing the soil previously to planting it, and of keeping it clean, by hoeing or otherwise, for a period afterwards. Mr Withers further presents us with an account of certain experiments made by him on the effects of manure on planted land, and contends that by combining the practices of tilling and manuring, not only will the better growth and earlier maturation of deciduous forest trees be promoted, but that the ultimate profits of the planter will be vastly enhanced.

Mr Withers' opinions on this subject are expressed in a Memoir addressed to the Society for the Encouragement of Arts published in the year 1826, and again in a Table showing the relative returns from land cultivated for timber under the two systems. "The principal object of this memoir," he observes, "is to communicate to the Society the result of several experiments on manuring land for forest trees, to demonstrate the absolute necessity of deeply ploughing or trenching it previous to planting; and of keeping it clean and free from weeds for some years afterwards. I had myself," continues he, "been long satisfied that this latter method was *indispensable* to insure success upon land, such as is usually selected for planting, and believed most other planters were of the same opinion; but, notwithstanding all that has been said and written on the subject, and though proofs of the utility of trenching and cleaning, and of the loss and disappointment attending a contrary practice, are daily and hourly presenting themselves to observation, there are great numbers of gentlemen who, with these proofs before

their eyes, still persist in attempting to raise plantations by merely digging holes and putting in the trees, and then leaving them to their fate amongst the whins, the fern, or the heath, the weeds, or other rubbish by which they are surrounded, and by which the more valuable trees, in most cases, are entirely destroyed in a few years."

From this preamble it is apparent that Mr Withers proposes to prove too much. The trenching or deeply ploughing of land previously to planting it, and the keeping of it clean for some years afterwards, may be admitted to be beneficial practices. We are ourselves ready to admit that, under certain exceptions—large exceptions indeed—they are beneficial practices, and may, with advantage, be adopted in the lower and more fertile parts of this island, where the rearing of hardwood trees, and not of pines, is the object to be aimed at. This is but the reiteration of an opinion often enforced by the most experienced English planters. But that deep ploughing, trenching, or tilling land, can be shown to be indispensable to the production of timber, cannot be admitted so long as thousands of acres of valuable wood can be shown to have been produced without trenching, deep ploughing, or tilling. Mr Withers, however, proposes to add the practice of manuring to that of trenching and hoeing recommended by former planters. He contends that the increased expenditure on this system will not only be replaced, but that a great ultimate gain will be the result: nay, not only so, but that the opposite system which he is pleased to designate the Scottish system, will be attended with failure and pecuniary loss. Here again it is apparent that Mr Withers attempts to prove too much. The system which he recommends of tilling and manuring forest land, may perhaps be shown to be attended with ultimate profit; but that the system which he condemns must be attended with ultimate loss, is surely a very hazardous assertion in opposition to the testimony of the many who have practised it. Mr Withers shows to us that his experience has not been of a very extensive nature. His own experiments, as we shall afterwards find, seem to have been limited to a few acres. Those who practise the system to which he is so much opposed, and which he facetiously terms the Scotch hole-dig-

ging system, are in the habit of practising on a somewhat more extensive scale. Some of these hole-diggers have tried their hundreds, and some their thousands of acres. One excellent nobleman, of whose patriotic labours we hope soon to have an opportunity of presenting an account to our readers, has lived to plant from ten to fifteen thousand acres of his own land, and to see the wood of his own planting fashioned into ships of war. If such plantations, then, have succeeded, and they too under all the disadvantages which a high latitude and elevated country present, Mr Withers must admit that his own acres and half acres have a considerable odds of authority to contend against. This system, too, which he so much despises, is probably that under which the oldest cultivated forests now existing in England, and in other parts of Europe, have been formed.

Mr Withers, in support of his argument, mentions cases within the range of his observation, in which plantations formed upon the one system have failed, while those upon the other system have succeeded. This is easy to be credited; for the more precautions that are taken against the failure of young wood, the less liable is failure to occur. So far trenching, hoeing, and manuring must be admitted to be useful. It is conducive, too, to the success of all planting, that the young tree should have a good set-off, as it may be termed; and to this, undoubtedly, the several operations described by Mr Withers contribute. Could we afford, then, or were it practicable, to trench and manure all our land previous to planting it, we should have fewer failures, and, it may be, better forests; but happily experience shows, in opposition to hypothesis, that we can produce good forests without incurring an expense which would deter many from planting even in favourable situations, and upon a small scale; but which in unfavourable situations, and upon the great scale, would render planting impracticable.

Mr Withers details the results of his own experiments on manuring. In 1818 he purchased an acre of land, and planted one rood of it with forest trees, having first trenched the land about two feet deep. "These trees," says he, "are now," that is in 1826, "in the most prosperous state, and, taken altogether, far exceed those adjoining which were planted seven years

before." "In the same year," says he, 1818, "I planted several trees in borders well prepared near my house; and being intended for ornament and shelter, more than ordinary pains were bestowed on them. This labour they have amply repaid. There are elms, oaks, and locusts from nineteen to twenty-eight feet high, with girth in proportion; while trees of the same description planted at the same time upon adjoining borders not so well prepared, are not near the size. In 1820 I purchased some more heath land near that above mentioned. I caused the heath or ling to be pared off and burnt in the manner recommended by Mr Cobbett in his 'Year's residence in America;' and in the following year I planted about twelve acres with forest trees. Upon part of these twelve acres I had flag-ashes spread before the trees were planted, and removed the ashes from the remaining part. In the first year, the trees upon the land where the ashes had been spread showed a most decided superiority over the trees where the ashes had been removed, and the difference *has become more manifest every succeeding year.*" The italics here are Mr Withers' own, for the purpose, we presume, of directing the attention of such of his readers as may be skilled in arithmetic to the question of how many succeeding years there are in the long period of six years. "Upon another part of the above twelve acres from which the flag-ashes were removed," continues he, "I spread some marl and brick-earth; and the trees there grow quite as vigorously as those which had the benefit of the flag-ashes; and from this circumstance I am convinced that marl or brick-earth is very serviceable in promoting the growth of trees upon poor light soils."—"Having thus witnessed the efficacy of manure in the several instances before mentioned, I determined never to plant another tree without manuring the ground. In the summer of 1823, I hired some heath land of the Fishmongers Company of London for forty years, under an agreement to plant fifteen acres, having the benefit of the plantation during the term, but leaving the Company one hundred trees an acre at the end of it. It was obvious that the faster I could make the trees grow, the better they would pay me, and with the above experience before me, I resolved to manure the land with both *marl* and *muck*." Having

described the operation, he adds, " They " (the trees) " look exceedingly well, and many of them made vigorous shoots the first summer ; the second year they nearly covered the ground, but during this summer their growth has been prodigious ; many of the ash trees have made shoots upwards of five feet long, and, upon an average, I think both they and the oaks have increased this year full three feet in height," &c. Mr Withers further gives an account of large shoots made by manured acacias and other trees, specimens of which he transmits to the Society of Arts.

Now, it is only to the less experienced planter that we can have occasion to observe, that experiments of this nature prove nothing as regards the profits and success of forest culture. The shoots which a young tree makes are often very great, and the growth may be supposed to be proportionally increased when the artificial stimulus of manures is applied. This is known to every nurseryman, and to every nurseryman's apprentice. But so far is this forced growth from being always favourable to the future health of the tree, that experienced planters will reject in the nursery all plants which have increased to a size disproportioned to their age ; and millions of such plants accordingly are destroyed by nurserymen as unsaleable. Even when plants are established in the forest, the excessive growth of annual shoots gives no secure indication of the future vigour of the tree ; and accordingly the specimens of plants sent by our author to the Society of Arts in the form of locust branches, prove nothing as to the result of a successful practice in planting. From the progress made by trees at this early age, it were a manifest fallacy to draw an inference as to their progressive growth until they reach maturity. This reasoning would be a fallacy were there no manure applied ; but it is still more calculated to lead into error when there is.

The growth of trees is not uniform from youth to age, but is greatest in the annual shoots during their earlier stages ; and the effect of an application of manure to the soil is not permanent in the case of trees, or of any other cultivated plants. Putrid manures, as farmers know, besides being exhausted by the plants they support, tend to rise to the surface, and to be

thrown out. In the case of forest trees, it is an opinion very generally entertained by planters, that the effect of a good manuring applied at planting is rarely to be traced beyond ten or twelve years. But, be this as it may, it would be contrary to analogy to suppose, that a manuring of the kind referred to can operate upon the growth of the tree till it reaches maturity. Under the same management, and when all other external circumstances are to the eye the same, trees arrive at very different degrees of magnitude; but generally, and *cæteris paribus*, the ultimate growth of trees may be said to be determined by the nature of the soil in which they are produced. This quality of the soil, however, is that which is natural and intrinsic, and not that which any single application of manures, such as that recommended by Mr Withers, can produce. Even where the quality of soils is improved by long cultivation, it is found that this acquired fertility does not operate on the ultimate growth of the tree in the same manner as the natural quality. Thus trees grown in gardens, although under the most favourable circumstances, as regards the artificial fertility communicated to the soil, do not generally attain a greater ultimate growth, though they may a more early one than others, on a similar class of soils to which no cultivation is given. It is a circumstance frequently observed, that trees which are stimulated by manures at first, on reaching the subsoil at a more advanced stage, stop all at once in their growth.

Several good consequences may doubtless result from the application of manures; but it is obvious that Mr Withers reasons from data that are wholly insufficient, when he ventures, on such a foundation, to predicate the growth of trees from youth to age. This, however, he does; and he further supposes trees to grow in the form of cones, and he calculates the contents of these cones according to a particular rule. He supposes the distances of these cones to bear a certain proportion to their height, and he is thus enabled to ascertain the number that can be taken out as the height increases. In this way he constructs a table to show the returns from growing wood during a prospective period of 64 years, and this he gives as a separate publication, under the title of "A Profit and Loss View of One

Acre of Land, on the System recommended by Mr Withers, and that generally adopted by the Scotch Planters.”

This table we shall give as nearly as our limits will allow, in its original form. It is partly founded on tables by Mr Waistell, respecting the growth of timber, published in the 26th volume of the Transactions of the Society of Arts. The height of the tree is taken to the top of the leading shoot; the circumference is taken half way up the tree, and no account is made of the lateral branches. What is termed the girt, is one-fourth of the circumference *. Estimates of the original expenditure under the two systems are thus given :

<i>Mr Withers's Original Expenditure.</i>		<i>Original Expenditure on the Scotch System.</i>	
Purchase of the Land	L. 12 10 0	Value of the Land	L. 1 1 0
Fencing ditto	1 10 0	Fencing ditto	1 10 0
20 Loads of Marl at 15d.	1 5 0	Trees, Carriage, & Planting,	3 10 0
20 Loads of Muck at 5s.	5 0 0		
Ploughing the Land . .	1 0 0		
Trees, Carriage, & Planting	7 10 0		
	<hr/>		<hr/>
	L. 28 15 0		L. 17 10 0

* By the common practice of carpenters, all timber is considered as measurable in which the square of the girt, to use their own language, is 6 inches, or, in other words, in which a fourth part of the circumference of the tree where measured is 6 inches. Timber of a less size than this is not considered to be measurable. Honest Hoppus is the great authority in such cases, and his tables, we believe, are in general use: his rule is to take the length of the trunk, so far as it affords the necessary girt, to take a medium of the girt, to divide it by four, and multiply by the length. The same course is practised with such of the larger branches as possess the necessary girt. This rule, indeed, does not give the true contents of the tree, but it is sufficient for practice, since the mode is uniform, and prices are calculated conformably to it. Mr Waistell takes the length of the tree to the top of the leading shoot. He measures the tree at the base, and assumes it to be a regular cone from the base to the height of the highest shoot. He takes half the circumference at the base, or, which is the same thing, the circumference at half the height. He divides this by four, squares the result, and multiplies it by the length. This rule is not more geometrically correct than that of Hoppus, and is less conformable to practice. The effect is to make the cubical contents of Mr Withers' tables less than they would be by the common rule: thus the tree of 90 feet in height and 12 inches of mean girt, which Mr Withers calculates to contain 80 feet of timber, would, according to the rule of carpenters, contain 93 feet 9 inches of measurable timber, as it were easy to show.

Mr WITHERS'S Expenditure and PROFIT, reckoning the Annual Increase of the Trees to be Fifteen Inches in Height and One Inch and a Half in Circumference at the Base.

Years old.	Height.	Girt.	Distance.	Cubical Content of each Tree when cut.	EXPENDED.	Principal and Interest at the End of each Year.	CUT OUT.			Reduced Expenditure.	PROFIT.	Principal and Interest of Profit at the End of each Year.	
							No. of Trees.	Cubic Feet.	Price per Foot.				VALUE.
FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.
1	12	4	4	1	1	1	1	1	1	1	1	1	1
2	12	4	4	1	1	1	1	1	1	1	1	1	1
3	12	4	4	1	1	1	1	1	1	1	1	1	1
4	12	4	4	1	1	1	1	1	1	1	1	1	1
5	12	4	4	1	1	1	1	1	1	1	1	1	1
6	12	4	4	1	1	1	1	1	1	1	1	1	1
7	10	4	4	1	1	1	1	1	1	1	1	1	1
8	12	4	4	1	1	1	1	1	1	1	1	1	1
9	12	4	4	1	1	1	1	1	1	1	1	1	1
10	15	6	6	1	1	1	1	1	1	1	1	1	1
11	17	7	7	1	1	1	1	1	1	1	1	1	1
12	17	7	7	1	1	1	1	1	1	1	1	1	1
13	17	7	7	1	1	1	1	1	1	1	1	1	1
14	30	3	3	1	1	1	1	1	1	1	1	1	1
15	30	3	3	1	1	1	1	1	1	1	1	1	1
16	25	4	4	1	1	1	1	1	1	1	1	1	1
17	25	4	4	1	1	1	1	1	1	1	1	1	1
18	35	3	3	1	1	1	1	1	1	1	1	1	1
19	35	3	3	1	1	1	1	1	1	1	1	1	1
20	37	4	4	1	1	1	1	1	1	1	1	1	1
21	37	4	4	1	1	1	1	1	1	1	1	1	1
22	30	4	4	1	1	1	1	1	1	1	1	1	1
23	30	4	4	1	1	1	1	1	1	1	1	1	1
24	32	4	4	1	1	1	1	1	1	1	1	1	1
25	32	4	4	1	1	1	1	1	1	1	1	1	1
26	35	5	5	1	1	1	1	1	1	1	1	1	1
27	35	5	5	1	1	1	1	1	1	1	1	1	1
28	37	5	5	1	1	1	1	1	1	1	1	1	1
29	37	5	5	1	1	1	1	1	1	1	1	1	1
30	40	6	6	1	1	1	1	1	1	1	1	1	1
31	40	6	6	1	1	1	1	1	1	1	1	1	1
32	43	6	6	1	1	1	1	1	1	1	1	1	1
33	45	6	6	1	1	1	1	1	1	1	1	1	1
34	45	6	6	1	1	1	1	1	1	1	1	1	1
35	47	7	7	1	1	1	1	1	1	1	1	1	1
36	47	7	7	1	1	1	1	1	1	1	1	1	1
37	50	7	7	1	1	1	1	1	1	1	1	1	1
38	50	7	7	1	1	1	1	1	1	1	1	1	1
39	50	7	7	1	1	1	1	1	1	1	1	1	1
40	55	8	8	1	1	1	1	1	1	1	1	1	1
41	55	8	8	1	1	1	1	1	1	1	1	1	1
42	55	8	8	1	1	1	1	1	1	1	1	1	1
43	55	8	8	1	1	1	1	1	1	1	1	1	1
44	55	8	8	1	1	1	1	1	1	1	1	1	1
45	55	8	8	1	1	1	1	1	1	1	1	1	1
46	55	8	8	1	1	1	1	1	1	1	1	1	1
47	60	9	9	1	1	1	1	1	1	1	1	1	1
48	60	9	9	1	1	1	1	1	1	1	1	1	1
49	60	9	9	1	1	1	1	1	1	1	1	1	1
50	60	9	9	1	1	1	1	1	1	1	1	1	1
51	65	9	9	1	1	1	1	1	1	1	1	1	1
52	65	9	9	1	1	1	1	1	1	1	1	1	1
53	65	9	9	1	1	1	1	1	1	1	1	1	1
54	65	9	9	1	1	1	1	1	1	1	1	1	1
55	65	9	9	1	1	1	1	1	1	1	1	1	1
56	65	9	9	1	1	1	1	1	1	1	1	1	1
57	70	10	10	1	1	1	1	1	1	1	1	1	1
58	70	10	10	1	1	1	1	1	1	1	1	1	1
59	70	10	10	1	1	1	1	1	1	1	1	1	1
60	70	10	10	1	1	1	1	1	1	1	1	1	1
61	70	10	10	1	1	1	1	1	1	1	1	1	1
62	70	10	10	1	1	1	1	1	1	1	1	1	1
63	80	12	12	1	1	1	1	1	1	1	1	1	1
64	80	12	12	1	1	1	1	1	1	1	1	1	1
RESULTS							372	8169	—	1181 14 9	—	1305 9 8	

Expenditure and LOSS on the Scotch System, reckoning the Annual Increase to be Six Inches in Height, and Half an inch in Circumference.

Years Old.	Height.	Grt.	Distance.	Cubical Content of each Tree when cut.	Original Expendi- ture.	Principal and Inter- est at the end of each Year.	CUT OUT.				Reduced Expendi- ture and LOSS.
							No. of Trees.	Cubic Feet.	Price per foot.	VALUE.	
	ft.	l.	f.	in. f.	£ s. d.	£ s. d.			s. d.	£ s. d.	£ s. d.
1	0	4		.....	17 10 0						
				.....	0 14 0	19 1 6	544			failures.	
2				.....			108			failures.	
16	8			.....		38 3 0					
23	12			.....			872			failures.	
29	15			.....		76 6 0	530	each	0 2	4 8 8	71 17 4
30		6		.....		75 9 2					
35	18	2	0 7 7	.....		96 5 11	388	203	0 4	3 7 8	92 18 3
41	21	2	0 10 11	.....		124 10 0	208	189	0 4	3 3 0	121 7 0
47	24	3	1 6 0	.....		162 12 3	143	214	0 6	5 7 0	157 6 3
48		9		.....		165 2 6					
53	27	3	1 11 9	.....		210 14 8	102	201	0 8	6 14 0	204 0 8
59	30	3	1 11 1	.....		273 8 2	76	206	0 10	8 11 8	284 16 6
63	32	4	1 3 6 8	.....		321 17 10	68	206	1 0	10 6 0	311 11 10
64		3	3 6 8	.....		327 3 5	302	1073	1 0	63 13 0	273 10 5
							2723	2293		95 11 0	273 10 5

"Since the publication of my Pamphlet," Mr Wither's adds, "I have received a great many communications relative to planting, most of them commendatory, but some expressing doubts of the benefits to be derived from the new mode of culture. One of the objections is, that the compound interest of the original outlay will be more than equivalent to the advantage arising from quick growth. The operation of compound interest cannot be known without calculation; and being desirous of ascertaining the probable efficacy of my mode of planting, and the validity of every objection to it, I formed a Profit and Loss Table of the Produce of One Acre of Land manured and planted, and the same quantity planted on the Scotch System, at the end of 64 years. As a foundation for my calculations, I took the tables of Mr Waistell, re-published with my pamphlet; and I did so because I knew of no other published statements of the produce of wood lands, and I trusted to his great experience for their correctness. He stated the average annual growth in healthy woods to be from 12 to 18 inches in height, with girt in proportion. My plantations have hitherto made a growth very far exceeding 18 inches; but in the table I anticipated a growth of 15 inches only on the average, and I took that of plantations on the worst system at 6 inches, a growth exceeding considerably that of many plantations with which I am well acquainted. I also allowed the same number of trees to live on both systems, although on mine the failures do not amount to five per cent., while, on the other, they certainly exceed fifty. I also reckoned upon thinning each plantation as recommended by Mr Waistell, so as to leave the trees at distances from each other equal to one-fifth of their height. I completed the table, and the results obtained were a *gain* per acre at compound interest on my plan of L. 6435 : 8 : 6, and an actual *loss* on the other of L. 152 : 17 : 9. With a view of drawing public attention to so important a subject, I determined to publish the table immediately. A considerable number were actually printed, and orders sent for advertising it, when I received a letter from Sir Thomas Beevor (to whom I had sent a MS. copy of the table), in which he stated,

and proved to my satisfaction, that forest-trees could not grow to the estimated extent, nor without injuring each other, so closely together as Mr Waistell had allowed them. Sir Thomas's letter was accompanied by a table of distances, about twice the width of Mr W.'s, and founded on the actual measure of trees and their distance from each other at different ages. I therefore remodelled the table according to the alterations suggested by Sir Thomas; and thus improved, I now lay it before the public, confidently anticipating, that though a difference of opinion may exist as to the profit to be actually realized, enough is shown to prove, that a liberal expenditure in planting and subsequent management, with compound interest thereon, will be amply repaid by the increased growth of the trees thereby occasioned.

"The profit above shown exceeds the original expenditure, improved at compound interest at 5 per cent. for the whole period, by upwards of L. 500 an acre. Surely no capitalist can wish for a greater return than this for his money, or a more secure investment for it than his own land; but if a further inducement for planting be wanted, it is to be found in the gratification of giving profitable employment to those who are now wasting their time in idleness or on the public roads, morally degraded in themselves and burdensome to the community at large.

"*Note added at the request of Sir Thomas Beever.*—It probably will be objected, that trees seldom arrive at the actual height contemplated by this table. It is a very fine tree which will mete 40 feet in length; but after a tree attains a certain state of maturity, instead of increasing in one continued shoot it diverges into large arms. These, provided they are allowed sufficient room to extend themselves, will cause an increase of timber fully equal to that which would have been obtained had the growth of the tree continued vertical. The figures of lengths, after the period alluded to, must therefore be considered only as *modes* of calculating a result which will be found to be practically true; viz. that the content of any tree at different periods, or of equally fast growing trees of different ages, are to each other as the cubes of their respective ages or periods of age."

The table, it will be seen, shows, that by the one mode of planting there will be standing on each acre at the end of 64 years, 40 trees 80 feet in height, and containing each 80 cubical feet of timber; that the whole value of trees, standing and cut down, will be L. 1181 : 14 : 9, and the whole profit derived L. 1305, 9s. 8d.; while, by the other mode of planting, the whole value of the trees standing and cut down will be L. 95, 11s., and the whole *loss* L. 273 : 10 : 5.

Now, to this table there is this very obvious objection, independently of those which may be shown to exist to the principle of calculation; namely, that it is not what it purports to be. It is not a comparison between the returns under two modes of planting, but a comparison between the returns under two assumed rates of growth in trees. It is assumed that in one

case trees will increase at the rate of 15 inches in height annually, and $1\frac{1}{2}$ inch in circumference ; and in another case at the rate of 6 inches in height, and $\frac{1}{2}$ inch in circumference : And, further, that they will continue this difference of growth uniformly for 64 years. The postulates being granted, it is indeed easy to show, that in the one case there will be a great return to the planter, and in the other no return at all. But does Mr Withers not perceive that the table really proves nothing as regards the relative returns of two systems of planting ? He calculates in one case on a return of 8162 cubic feet of timber, in the other on a return of 2292 feet. Now, whether he assumes all this, and reasons analytically, or whether he begins at the beginning, and reasons synthetically, the result is the same. He assumes what is really to be proved ; namely, that in the one case above 8000, and in the other above 2000, cubical feet of timber will be produced in 64 years. Granting that the growth of trees is uniform (which it is not) ; that in 64 years they will reach the gigantic height of 80 feet (which they will rarely do) ; that their mode of growth is analogous to a gradually enlarging cone (which it never is), what does this prove as to the effects of muck and marl ? Certainly nothing, if we found upon such experiments as Mr Withers records. Or granting that muck and marl will produce such effects, what does this prove as to the effects of a system where neither muck nor marl are employed ? In the one case, we have presented to us an assumed case of successful planting, in the other an assumed case of failure in planting. Looking at the table itself, we find that at the age of 23 years the acre of land under the one system has produced 872 faggots of no value ; at the age of 29 years 532 walking sticks, worth 2d. each ; and at the mature age of 64 years, trees 4 inches in girth, and containing each 3 feet $6\frac{1}{2}$ inches of timber, worth 1s. the foot. The error in the conclusion shows, that the premises must be unsound. Trees which, in the period of 64 years, should produce only $3\frac{1}{2}$ feet of timber, worth 1s. the foot, would be reckoned a failure upon the most worthless soils ; and on all tolerable soils would be grubbed up as useless, or burned as faggots, ere they attained a fourth part of the age assigned to them *.

* The reader may have remarked certain errors in the details of these Tables : Thus, the land upon which wood is planted, is not annihilated by

The next essay of our author is in the form of a letter to Sir Walter Scott, controverting certain opinions expressed by the latter in a very pleasing essay on planting, which all planters ought to read, contained in the *Quarterly Review*. We do not certainly propose to take up the gauntlet for the Author of *Waverley*. The task of replying to Mr Withers has already been performed by Sir Henry Steuart, who, in a note to the second edition of his own work, disposes of some of the opinions of that gentleman, though, in doing so, we cannot help thinking, that the ingenious Baronet falls himself into certain errors, quite as great as those which he endeavours to controvert. Sir Henry Steuart, we must observe, is himself one of the few writers on the north side of the Tweed who approve of what may be termed high cultivation for forest trees. This is entirely consonant with the principles he endeavours to establish, and with the practice of the art which he has done so much to render perfect. Sir Henry, however, like every man of sense and knowledge of his subject, is aware that the system must be limited in its application to narrow bounds.

"The principle of deepening and pulverizing soils, to forward the growth of trees, is," observes he, "far from being new. It is a mode of culture which was well known to the ancients. It was fully recognized and acted on in the days of Evelyn and Cooke; and it has, since their time, been familiar to every well-instructed gardener and nurseryman in the United Kingdom, down to the present period. The main use, therefore, of Mr Withers's pamphlet, is to show its superior advantages, and give it a more extensive application. Why it has so seldom been applied by landowners beyond the kitchen-garden and the shrubbery, seems very surprising, since the slightest trial is sufficient to convince any gentleman, that plantations made on any land susceptible of culture, may in this way certainly be more speedily raised, and probably more cheaply, than by any other method. The scientific principles on which the process should be conducted, and my anxiety to impress them the act of planting, as is assumed in the tables, but remains while the wood is growing, and after it is cut down. The loss, therefore, is not L. 12, 10s in principal and interest for 64 years, but the loss of the interest of L. 12, 10s. for 64 years. To these and other errors, we have not thought it necessary to direct attention. It is sufficient that the general result is shown to be erroneous.

on the minds of planters, are sufficiently shown in the present section and notes, whether for arboricultural or agricultural purposes, to which Mr Withers's able pamphlet may serve as a practical commentary.

"For all plantations in parks and pleasure-grounds, and even in many that are intended solely for profit, I highly approve of previous trenching and manuring, and keeping the ground clean with the hoe, but by no means digging it with the spade for a few years; that is, in situations where the nature of the ground will admit, and where sufficient manure for a green-crop can be procured. Having for many years successfully followed this method myself, I can with the greater confidence recommend it to others. But, *from the very nature of the thing*, it is evident that it cannot be adopted for GENERAL PLANTING, or ever come into universal use. All men, however, will admit, that Mr Withers is entitled to great praise for so earnestly pressing it on the public attention.

"There is one thing, with which I have been rather surprised in Mr Withers's pamphlet, and which cannot be passed over without notice by any person of intelligence, and that is, his denominating the ordinary or pitting method of planting, as *every where* practised, without any previous deepening of the soil, 'The SCOTCH System;' and for no other alleged reason that I can discover, on the most attentive perusal of his publication, than that some Scotch contractors had executed about forty acres of plantation for Admiral Windham, according to this method, and that the thing had turned out 'a total failure.'

"It is certainly very candid in Mr Withers to inform us, that he knows nothing of Scotland or Ireland, and that his observations on wood, and his practice in raising it, are wholly confined to Norfolk. His pamphlet as clearly informs us, that he knows nothing of general planting, or of its history and progress in Britain, and the rest of Europe; and that the anatomy of plants and vegetable physiology have not come within the range of his studies. Now, in these circumstances, it would have been as well if he had not insisted on it, that the common and well-known style of executing *general* planting, in every country where it is known and cultivated, is peculiarly 'the SCOTCH method;' because the English, Irish, French, German,

or any other national epithet, would have equally designated the practice. The Germans have about a hundred writers on woods and forests (double the number that Varro enumerates in his time), among whom M. Burgsdorf, Master-General of the Forests of Prussia, and M. Hartig, who held the same situation in the principality of Solms, are the most celebrated. The French, in the same way, have nearly thirty authors on this subject, of whom MM. De Perthuis, Baudrillart, and Varenne-Fenille, are the latest and best. These, together with our own Evelyn and Cooke, Miller, Pontey, and Speechley, all treat of both the trenching and the pitting mode; but not one of them ever made the notable discovery, which has been made by Mr Withers, that the latter is peculiarly the SCOTCH method. On the contrary, they all mention both systems, as *practised* in their different countries, and *practised* in each under *different* circumstances, as it is in England*.

“ The very favourable manner in which Mr Withers’s first pamphlet was received by the public was, of course, very gratifying to the author, and seems to have led him to assert the universal applicability of the trenching method. What was good for Norfolk, he naturally thought, could not well be bad for any other tract of country, whether the Highlands of Perthshire, or Yorkshire, or Connaught; and that whatever system of planting was calculated to produce (as Pontey expresses it) ‘ the *greatest weight* of marketable Wood,’ and to produce it *soonest* and *cheapest*, must necessarily be the best for all possible purposes, whether manufacturing, agricultural, or naval. Fully impressed with this conviction, Mr Withers undertook to draw up a second pamphlet, more extensive than the first, chiefly, as it appears, with the view of “ IMPROVING THE MANAGEMENT OF THE ROYAL FORESTS, AND RAISING SUPERIOR TIMBER FOR THE NAVY.”

In commenting on this pamphlet, which, as we have said, is in the form of a letter to Sir Walter Scott, Sir Henry Steuart

* “ M. De Perthuis is of the opinion usually entertained in England, and also by Sir Walter Scott, that trenching with the spade is too expensive to be practised by the landowner, unless for plantations intended for ornament near the mansion-house.—‘ On sent que le défoncement ne peut-être fait qu’à bras d’hommes; et comme il occasionne une grande dépense au propriétaire, in ne peut guères employer ce moyen, lorsque ces facultés pecuniaires le lui, permettent, que dans les plantations destinées à la decoration de sa maison.—P. 282.”

observes:—"Respecting the *manner* of this composition, I shall say little, as 'plain and unassuming' are epithets which *cannot* be applied to it; and I shall say the less from being informed that the public in general, and the author's friends in particular, loudly condemn the whole style of address adopted: and I entertain no doubt, but that his own good sense will, ere long, induce him to condemn it himself. Mr Withers may rest assured that neither the interests of learning, nor the advancement of science, among a polished nation, ever yet were promoted by a gratuitous departure from the rules of decorum and urbanity. But the *matter* is an object of far greater magnitude than the manner; and as the former might, by possibility, have some weight with the Commissioners of Woods and Forests, I feel called upon to obviate, in as far as I can, the extensive injury which the principle contended for might occasion, to the 'future navies' of the empire."

Sir Henry Steuart then proceeds to show, that however beneficial the practice of trenching and manuring, and the raising of timber, may be, the introduction of such a system into the Royal Forests would be pernicious and dangerous, as tending to produce timber of too rapid a growth, and too soft a quality for naval purposes. "Culture," says he, "as physiologists admit, has nearly the same tendency towards affecting the growth of plants, as the removing of them to a better climate, by *expanding the parts* of the entire vegetable. To any one at all acquainted with vegetable economy, this is well known; and it is remarkable in all culinary vegetables and cultivated grasses, which assume an appearance in our gardens and fields widely different from that which they display in their wild or natural state. In the same manner, the absence of culture, or the removing the vegetable to a colder climate, and a worse soil, tends to *contract* or *consolidate* the plant.

"The same general law operates, in a similar way, on all woody plants, but, of course, less rapidly, owing to the less rapid growth of trees, from the lowest bush, to the oak of the forest. In all of these, the culture of the soil tends to *accelerate vegetation*, and, by consequence, to *expand the fibre of the wood*. It necessarily renders it softer, less solid, and more liable to suffer by the action of the elements. Let us shortly give a few examples of the uniform effect of the law of nature.

“ Every forester is aware how greatly easier it is to cut over thorns or furze that are trained in hedges, than such as grow naturally wild, and are exempt from culture. Gardeners experience the same thing in pruning or cutting over fruit-trees or shrubs; and the difference in the texture of the raspberry in its wild and in its cultivated state, is as remarkable; for although the stem in the latter state is nearly double the thickness of that in the former, it is much more easily cut. On comparing the common crab, the father of our orchards, with the cultivated apple, the greater softness of the wood of the latter will be found no less striking to every arboriculturist.

“ Further, the common oak in Italy and Spain, where it grows faster than in Britain, is ascertained to be of shorter duration in those countries. In the same way, the oak in the Highland mountains of Scotland or Wales, is of a much harder and closer grain, and therefore more durable than what is found in England; though on such mountains it seldom rises to the fifth part or less of the English tree. Every carpenter in Scotland knows the extraordinary difference between the durability of Highland oak and oak usually imported from England for the spokes of wheels. Every extensive timber-dealer is aware of the superior hardness of oak raised in Cumberland and Yorkshire, over that of Monmouthshire and Herefordshire; and such a dealer, in selecting trees in the *same* woods in *any* district, will always give the preference to oak of *slow growth*, and found on cold and clayey soils, and to ash on rocky cliffs, which he knows to be the soils and climates natural to both. If he take a cubic foot of park-oak, and another of forest-oak, and weigh the one against the other (or if he do the like with ash and elm of the same description), the latter will uniformly turn out the heavier of the two.”

These and similar observations afford an opportunity to the indefatigable Mr Withers, to retaliate upon his ingenious adversary, in return, we presume, for the very wholesome lesson on good manners and good temper, which the latter has so properly given. This he does in the last pamphlet quoted by us, namely *The Letter on the Improvement of the Quality of Timber to be effected by high cultivation*. We need not now detain our readers by the consideration of this question. Whether, of

trees of the same species and variety, those of quick growth produce a softer timber than those of slow growth, is a question perhaps more curious than practically important, since few planters will fear that their trees will grow too fast, or will desire to see their vigour restrained that the timber may be rendered more hard. The question really at issue is not whether the wood of the oak produced in the plains of England, or on the mountains of Scotland, be the hardest (for of this there can be no question); but whether of the oaks produced under similar circumstances of soil and situation, those of quick or of slow production, be the hardest. We must say that we are rather disposed to think, that, as in the case of the ash, oaks of vigorous and rapid growth will generally, *cæteris paribus*, produce better timber if it is allowed to come to maturity, than those of feebler growth. But, be this as it may, we do not in the slightest degree share in the apprehension expressed by Sir Henry Steuart, that any system of culture capable of being introduced into the Royal Forests would tend to produce less useful timber. The merely trenching and cleaning of the ground surely will not do so; and with regard to the manures proposed, can Sir Henry Steuart seriously suppose that the effect of these can be felt when the oaks have reached the age of naval timber? We feel assured that he may dismiss such a fear as groundless, and that all the muck and marl of Mr Withers would not produce one plank the less serviceable for the dock-yards of the country. Nay, not only so, but we are of opinion that if careful cultivation of forest timber be anywhere requisite, or expedient, it is in these forests.

It is difficult to restrain a mental curse on the political memory of successive races of ministers, who left these national forests in ruin, or bartered them to dependants, as the price of political favour. Had these neglected wastes been planted when the want of the necessary supply of naval timber was first felt, they would have been ere now covered with "the unwedgeable and knarled oak" of England; and have formed a source of enduring wealth to the nation, beyond what millions upon millions of wasted treasure have in too many cases been able to gain. Until a time within our memory, these forests seem to have been looked upon only as the means of providing for political pensioners. They had been suffered to dwindle away by

grants and encroachments of every kind. The timber had been gradually felled, burnt as fuel, wasted and plundered, so that in the end little of it remained beyond decaying stumps, uncared for, and perishing from neglect and natural decay. Acts of Parliament passed so long ago as the reign of Charles II. and William III., for planting certain parts of these forests, had never once been acted upon. Nay, some forests planted by the latter prince, for the express supply of the future navies of his country, had been suffered to run waste almost within sight of our dock-yards, unpruned and useless, till our own day. Animals of every kind found refuge amidst the gorse, brambles, and thistles which they produced. In one of them, the New Forest, between two and three thousand wretched horses were a few years ago found feeding, or rather starving; and it required all the power of the Lord Warden, backed by an army of verderers, the counsel of the Law Officers of the Crown, and, finally, an act of Parliament, to free it from its intruders. In the mean while, wardens, rangers, keepers, surveyors, woodwards, regards, woodmen, and others of a hundred denominations besides, multiplied and flourished, whose *rights* it has been no easy matter to extinguish since, by extensive grants, and even large sales, of the same forests.

Notwithstanding the growing and pressing claims of the Navy during the war, and the decreasing supplies of serviceable timber, this scandalous state of things in the forests continued until about the year 1803, when, on the suggestions of the late Mr Fordyce, surveyor-general, some feeble attempts were made to repair the evil by planting. It was not, however, till about the year 1810, when the management of the land revenues and forests of the Crown was transferred by two separate acts of Parliament, the 34th and 50th of George III. to a different set of commissioners, that a more efficient system of management was established, and that means were taken to plant the forests.

It need hardly be here observed, that the timber required for naval ship-building must be of great size. The commissioners, in their first report to Parliament, computed that the oaks employed ought on a medium to be a hundred years old, an age far exceeding that to which individuals find it their interest to suffer their woods to stand. Hence it is to public forests that

the nation must look for a secure supply of naval timber. Doubtless the larger part of that used has been, and must be, derived from private sources ; but this means of supply is to be regarded as contingent, and not to be depended upon in the case of future wars. So long ago as the year 1788, the annual consumption of oak timber, for the construction and repair of our ships of war, was computed at 50,000 loads, equivalent to 33,333½ tons, or 200,000 cubical feet.

The Parliamentary Commissioners, with reference to this fact, declared that the woods on private estates could not be relied on for any thing like a regular supply to that amount. Their inquiries, they stated, had led them to conclude, that the quantity of large timber on such estates was in a state of progressive diminution, and would in the course of time be totally exhausted, and they therefore recommended, that a sufficient quantity of land belonging to the Crown should be set apart for securing a supply equal to the above amount, and they computed that 100,000 acres would be required for that purpose. In a report made in the year 1812, the first by the Commissioners under the acts 34th and 50th Geo. III., it is computed that 110,000 loads would be required to keep the navy on the footing on which it then stood ; but that, by prizes captured in war, the substitution of inferior timber for oak, and other means of economizing the use of materials, about 60,000 loads might suffice.

Now, calculating on an average 40 oaks to be on the acre, at the age of 100 years, and taking the average quantity of timber in each tree at a load and a half, 1000 acres would, at the end of 100 years, produce 60,000 loads, or enough to maintain the navy for one year. Upon these data, the Commissioners computed that 1000 acres, if they were so planted and managed that the timber on each 1000 acres could be felled in successive years, and then 1000 acres immediately replanted, would be requisite and adequate for maintaining a navy like the present for ever. The obvious mode, then, of obtaining this result, was to plant 1000 acres each year, and to continue this operation for 100 years, when 1000 acres would be ready for felling, and when, by means of felling and replanting an equal extent, the same rate of supply could be maintained for ever. But the Commissioners were justly dissuaded from an operation thus slow, and

liable to interruption, and proposed instead, that the planting should proceed at the rate of 4000 acres per annum, so that the whole 100,000 acres should be planted in 25 years.

In the fourth report of the Commissioners made in the year 1822, it is admitted that of all the forest land belonging to the Crown, the utmost that can be obtained or calculated upon for the production of naval timber is 62,627 acres.

	Acres.
Of this quantity there appear to have been planted, or to have been enclosed, and in the course of being planted,	44,627
And it is computed that of lands unenclosed, but so stocked with trees as to be reckoned in the quantity productive of timber, there are	7,000

Making the whole extent of land belonging to the Crown, now in timber or young plantations, or in the course of being planted,	51,627
And it is further computed, that by the operation of acts of Parliament authorising new enclosures, there may be obtained the further extent of	11,000

In all, 62,627

We thus have the means of obtaining from these once magnificent domains of the Crown, about two-third parts of the extent of land requisite for constructing and repairing our ships of war; and nearly 100 years must elapse before this supply can be made available. For one hundred years, then, we must depend on casual, contingent, and decreasing supplies, for the maintenance of that glorious and unrivalled navy, upon which all our means of safety must depend. One hundredth part of one year's revenue of England, would at any time have covered these forests with oaks, to have become the pride and safety of our children's children*.

* To give an idea of the enormous quantity of timber necessary to construct a ship-of-war, we may observe that 2000 tons, or 3000 loads, are computed to be required for a seventy-four. Now, reckoning 50 oaks to the acre, of 100 years' standing, and the quantity in each tree to be a load and a half, it would require 40 acres of oak forest to build one seventy-four; and the quantity increases in a great ratio, for the largest class of line of battle ships. The average duration of these vast machines, when employed, is computed to be fourteen years. It is supposed, that all the full-grown oaks now in Scotland would not build two ships of the line.

The late Lord Glenbervie, the First Surveyor-General under the new Commissioners, seems to have set about the task of planting the forests, with an honest desire to perform it with diligence; but, unhappily, he began by making experiments, as if planting were a new art, instead of keeping in the track which older experience had pointed out to him. He set about planting acorns and improper plants, when, lo! his acorns were annihilated, and his plans nearly rendered abortive, by the invasion of an army of *field-mice*. The history of the mice is really curious, and is well recorded by Mr Billington, the individual employed to superintend the planting of the Forest of Dean, in the county of Gloucester, and of Chopwell, in the county of Durham*. Mr Billington is a plain shrewd man, who trusts to his own observation, and cares little for received opinions

“* I have before stated,” observes he, “that the short-tailed or field mouse, the rooks, and various vermin, took the acorns out of the holes, and caused a great deficiency in the plants at first coming up; but of the destructive ravages of that little animal the field mouse, I was not so well aware till two years after I had been in the Forest, and the third from the commencement of planting it with acorns. In making my survey of the state of the enclosures and plants for the information of the commissioners, I had frequently observed great quantities of the small oak plants, from the acorn having been barked and bitten off, particularly where the grass was thick, and nearly all the oak that had been planted in the wet and moist grounds (for some ash had been planted in those situations), were barked all round the stem in the same manner as the oaks, only more so, as they seemed to be fonder of the ash than the oak bark. We all thought it was the hares that did the mischief, although at that time there were very few hares in the plantation; but still we found vast quantities barked and bitten off, and always so near to the ground, about 6 or 7 inches high. In the autumn of 1812, that circumstance struck me forcibly, so much so that I was induced to examine more minutely; when I was not a little surprised to find, at almost every plant so barked or nibbled, great quantities of very small dung, much less than hare’s dung, but something similar in its appearance; I thought of course it must be the field mouse, which we soon found too true.

“Having before observed, where the grass and other herbage were thick and rank, the plants were chiefly barked, but where the stem of the plant stood clear of herbage of any kind, the plants were scarce ever touched; this is worthy of remark, and very natural, for without shelter they would have been more exposed to their natural enemies the hawk, owl, &c., and like most other mischief it must be done in the dark. Some of the small seedlings were barked all round the stem, as high as the mice could reach; others only in part, but much nibbled, and great quantities bitten off; and as the plants were destitute of leaves, and the rank grass getting above them, and exclud-

where they do not accord with it. His work contains facts and observations well meriting the attention of practical planters.

ing the light, the greater part were soon killed, wherever the grass or other herbage was rank.

"Before the autumn of 1813, the mice had become so numerous, that we could pick up four or five plants of the larger or five year old oaks on a very small space of ground, all bitten off, just within the ground, between the roots and the stem; and not only were the oak and ash injured, but the elm, sycamore, and Spanish chesnut, of which the mice are not so fond as of the two former. Of the hollies that had been cut down, great quantities of young shoots had sprung up from the stools, were looking very well, and making a fine shelter, as we thought at the time, perhaps thirty or forty shoots from a stool or old root. These were nearly all destroyed in one winter, by the mice barking them in the very same manner as the oak and ash; nor did the crabs, willows, nor even the strong shoots of the furze, escape their ravages; they appeared to feed very much on the young shoots of the furze or whin; and I have seen hollies, as thick as a man's leg, barked all round, and as high in the bush as four to five feet from the ground. This was in some thick bushes, where were plenty of leaves and old stumps to shelter them when at their mischievous work. The willows were barked every branch, to the height of three or four feet from the ground, when they grew in thick shelter of any kind.

"The mice had now become so numerous and destructive, that, when Lord Glenbervie was in the forest in the autumn of 1813, he became so alarmed about the final success of raising a forest, that he soon after wrote a letter to the Deputy-surveyor, instructing him to pursue every means we could think of, by cats, dogs, owls, poison, traps, or any method that could be devised, even to cutting up all the grass and fog by the roots, offering a reward at the same time to any one that could find out the most effectual way of destroying them. No expense was to be an obstacle, even if the cost was more than had been expended on the enclosing, holing, and planting, so anxious was his Lordship for the success of the undertaking.

"Operations were immediately commenced with traps, baits of various kinds, with poison, and with dogs and cats, but all with little success, so extensive are the plantations. At length a person hit upon a very simple, and, eventually, a very efficacious mode. Having, in digging a hole in the ground some time previous, observed that a mouse or mice had got in, and could not get out again, the idea was suggested to him, that, by digging holes of a similar form, he might succeed; he tried accordingly, and found it to answer.

"The holes for catching the mice were made from 18 inches to 2 feet long, 16 or 18 inches deep, about 10 inches or the breadth of a spade at the top, 14 or 15 inches wide at the bottom, and 3 or 4 inches longer at the bottom than the top. If the ground was firm, the better; some holes were made in a circular form, but this was only a work of fancy, which cost more trouble than the oblong holes, as either sort answered, provided they were well made, the sides firm and even, and 3 or 4 inches wider every way at the bottom than at the top, otherwise the mice would run up the sides and get out again, if they

He cannot be held answerable for the schemes of his employers, and he seems to have done what he could to repair the consequences of them. The first experiment which he records was made in the Forest of Dean, consisting of 23,015 acres, of which 11,000 were planted.

We must refer to the work itself for the details, which are, in various respects, instructive. The difficulties and failures which he records, arise from mice, from furze, from fern, from rooks, from ants, &c. &c. Many of these inconveniences, we

could find any footing. But, if well made, when they were once in they could not get out again; and, what is very extraordinary, they would really eat each other when left long in the holes! Most of the mice were caught in the latter end of the year, and, what is rather singular, in the course of a wet or stormy night we always caught the greatest quantity; on the contrary, in calm, dry, or frosty nights, very few entered the holes; but, generally, most were caught when the holes were fresh made. Baits of various kinds were put in the holes to draw them, but without any visible effect, as the holes, without the baits, caught full as many; what attracted them in we could never tell, whether the smell of the fresh earth, or what other cause, we could only conjecture. We have taken 15 in a hole in one night. Sometimes the holes were made in the drains where there was not a constant run of water, as the mice appeared to run along the drains, and a great many were caught in these holes.

"The people who made the holes of course looked after the mice, and were paid for them by the dozen. They were obliged to attend to the holes to take them out very early in the mornings, otherwise the crows, magpies, hawks, owls, weasels, and other vermin, attended very regularly, and made the first seizure. Several of these depredators were caught in the fact, the men dropping on them so suddenly, that great quantities were taken out and never accounted for. We soon caught upwards of thirty thousand, that were paid for by number, as a person or two were appointed to take an account of them and see them buried, or made away with, to prevent imposition.

"It is said by naturalists, that the beaver will fell trees with his teeth; but I have never seen an account of mice felling oak trees, yet have I found oak trees cut down by them of 7 and 8 feet high, and an inch and half in diameter at the place bitten off, which was just at the root, as before noticed. When examining for the thick part of the root below where it was bitten off, I could never find any part of it left, so that it is very probable it must have been eaten by them; but whether this sort of food was softer, or more palatable, than the part exposed to the atmosphere, I cannot tell. I have by me at this time several of the large plants, before described, that were bitten off by the mice, and among them a large beech, for the inspection of any gentleman or naturalist who may be desirous of witnessing, with his own eyes, the wonderful power of so diminutive a creature as the mouse in felling trees.—
Work on Planting, by William Billington, 1825.

presume, might have been lessened or overcome by a selection of plants of the proper kind and age, and by using them in sufficient number. Mr Withers proposes to provide against similar failures, by trenching and manuring the ground; and though we have not the same faith in muck and marl, we are really seriously of opinion, that if there is any one case in which a previous and careful preparation of land for planting is expedient, it is in what remains to be planted of these unhappy forests. Here, the pecuniary sacrifice is to be disregarded. A hundred thousand pounds is little to be taken from a revenue from which hundreds of thousands, we grieve to say, have been squandered: And, whatever care should be bestowed in the culture of these forests, it is impossible, we conceive, to share in the apprehensions of the worthy Baronet of Allanton, that the safety of our navy would be put in jeopardy.

Although in the treatment of plantations there are general principles applicable to all cases and countries, those principles must, in their practical application, be modified by peculiarities of country, climate, and soil. A treatment of woods, which may be good in the Wealds of Kent, may be bad or impracticable on the ridges of the Cheviots, or the glens of the Grampians. In the lower parts of England the most valuable of our forest-trees may be readily produced, and that without any mixture of firs for the purpose of affording temporary shelter. As we ascend to a higher latitude or greater elevation, we approach to the region of pines, and a great part of the country is truly within that region. In such cases the pine necessarily forms a main object of forest culture, often by itself, and often as a means of nursing or sheltering trees less suited to the climate. In the latter circumstances, the preparation of the soil for planting by trenching is often useless, and in most cases impracticable. In the former circumstances, the practice is for the most part highly beneficial, and will be well repaid by the quicker growth and increased value of the timber. The practice of keeping the land clean for a period after planting is, in a champaign country and favourable climate, generally beneficial, and many times necessary to repress the growth of herbage and hurtful plants. In a country of mountains with a less favourable climate, the growth of such plants

is less vigorous, and is scarcely felt as injurious where the heaths alone are produced. Hence, in a high country, the careful weeding of the soil after planting is less requisite than in a low country, and may, for the most part, be dispensed with. Thus different circumstances require and give rise to different practices in the cultivating and rearing of forest-trees; and planters would do well to consider with candour the causes of such differences rather than too rashly condemn all that may differ from their preconceived opinions.

We have said, that, under certain limitations, we approve of the preparation of land for deciduous forest-trees by trenching, and of keeping the ground clean for a period afterwards; but the process of trenching should, in all cases of land broken up for the first time, be performed by manual labour. Trenching by the spade to the depth of two feet may be well performed in the least favourable cases for about L. 7 the acre. The probability of the first expenditure on such operations being replaced by the ultimate growth of the trees, may be judged of by this, that, taking sixty years as the period of growth of trees, L. 1 principal, and at 5 per cent. compound interest, will amount in this time to L. 18 : 13 : 6; so that, by multiplying our expenditure by about $18\frac{1}{2}$, we shall find the increased value of timber, which, at sixty years, will replace that expenditure. Contrary to the opinion very generally entertained by planters in Scotland, we are of opinion that the increased expenditure, by more careful cultivation will, in innumerable cases where hardwood trees are the object, be replaced by the greater ultimate growth. We have endeavoured indeed to correct certain errors, which we conceive Mr Withers has committed; but, after every proper correction is made, enough of truth will remain in his general reasoning to recommend the principle which he advocates to the serious consideration of planters. Trees do not increase uniformly and vertically in the manner assumed by Mr Withers, nor do they consequently present the analogy of a gradually enlarging cone. Nearly all the measurable timber of trees is derived from the trunk, which increases to a certain height, often at a very early stage of its growth; and the further increase as regards the production of timber, is derived from the increase of the trunk in circumference. Although, therefore, trees will not ge-

nerally increase in the manner and degree which Mr Withers's calculations assume, there is one circumstance to which he has not adverted, namely, the great advantage of causing trees to rise with a clear and straight stem, which is the effect of vigorous growth during their earlier stages, and which careful culture during that period will produce. The difference between a tree which grows vigorously during its early stages, and one which does not, will generally be found to constitute the difference between a good tree and a bad one—that is, between success and failure in planting; and all the barbarous mutilation which we see inflicted on young forest trees under the name of pruning, will do nothing to produce a straight and good stem, in comparison with a vigorous growth for the first fifteen or twenty years. The stems and large branches of deciduous trees may be considered as approaching to frustums of cones, the solid contents of which are to each other as the cubes of their homologous sides. Hence a trunk of three feet in diameter will contain about three and a half times the quantity of timber which a trunk of two feet will contain, and twenty-seven times the quantity which a trunk of one foot will contain; and hence the prodigious advantage will be apparent of producing an increase of growth. An elongation of the trunk generally ensures a tree not only of good form, but of good dimensions, and hence the importance of cultivation in the raising of timber.

While we thus advocate a careful cultivation of deciduous forest-trees, we feel, as we have said, that the practical application of the system is circumscribed within narrow limits: And desiring, as we earnestly do, that the waste lands of Great Britain and Ireland shall be made to produce wood, where no other produce of value can be raised, and knowing that this would never be were a costly preparation of the soil indispensable, we are desirous of correcting all misrepresentations as regards the result of the only system of planting, which, in such cases, is practicable or expedient. And it is consoling to know, that trenching and tillage, however beneficial in many cases, may be left out of the scheme of the forest planter in many more; and that, at a vastly less present expense than such operations would impose, the bleakest tracts of our country may be covered with wood.

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While we thus advocate a careful cultivation of deciduous forest-trees, we feel, as we have said, that the practical application of the system is circumscribed within narrow limits: And desiring, as we earnestly do, that the waste lands of Great Britain and Ireland shall be made to produce wood, where no other produce of value can be raised, and knowing that this would never be were a costly preparation of the soil indispensable, we are desirous of correcting all misrepresentations as regards the result of the only system of planting, which, in such cases, is practicable or expedient. And it is consoling to know, that trenching and tillage, however beneficial in many cases, may be left out of the scheme of the forest planter in many more; and that, at a vastly less present expense than such operations would impose, the bleakest tracts of our country may be covered with wood.

This system of planting,—the most important, because the most generally applicable,—may be termed the Economical, in opposition to that in which the culture of the soil is practised. Various Scottish writers have recently treated of this system, generally men whose knowledge has been derived from extensive practice. To the list of these deserving individuals, we have to add the first author quoted at the head of our article, whose work, now in the course of being published, we have pleasure in recommending to the attention of all planters. It is written throughout with judgment and good taste, and with that knowledge of the subject which extensive experience has supplied. The author details the results of his practice with fidelity, and never seeks to mislead by exaggeration. He is thus at all times a safe guide; and, if he does not enter into an extensive field of discussion, we feel that it is because he will not venture beyond the range of his own experience. His instructions have an especial reference to the situation and climate of a high country; and, it may be supposed, that he advocates that system of planting which is best suited to such circumstances, or rather which is the only one practicable or expedient where they exist. He condemns, accordingly, that system of planting to which we have referred, and by which the original expenditure is increased, in the hope of a greater ultimate return. He begins his instructions with the operations of the nursery, and censures whatever may uselessly enhance the cost of production at this early stage. The forcing system of the nursery, indeed, is erroneous in principle, and injurious in practice, and is the cause of numerous failures in forest culture, which are ascribed to other circumstances. Our limits, however, will not allow us to follow the author into the details of his practice. Of these details, that which may be considered as new, is a peculiar method which he proposes of raising the oak; but that which is the most important with reference to our present subject, is the illustration which is afforded of the degree to which the economy of labour may be carried in planting. Our English readers will be surprised to learn, that firs may be raised and planted in heath land, to the number of 4,000 per Scottish acre, at the rate of from

fifteen to twenty shillings per acre. This is effected by means of a light species of spade, called a planting-iron, introduced into practice in the northern counties about fifty years ago. At this moderate rate of expenditure, land not yielding a produce of a shilling the acre in its natural state, may be planted with pines, both those indigenous in high latitudes, and that invaluable species which we owe to the Alpine countries of southern Europe. "An acre of land," observes our author, "which is dry, and, in its natural state, covered with thriving heath, though it have no higher marks of fertility than appear in the production of this hardy plant, will bring 600 Scots firs or larches to such a degree of maturity in sixty years, that they will be worth, on an average, 10s. each, or L. 300 Sterling in whole. This sum, divided by the age of the trees, gives a rent of L. 5 annually for the land. Nothing will be to deduct from this for the expense of planting, enclosing, and management, as three or four thousand trees being at first put into the ground, those cut down from time to time, in order to reduce the plantation to the necessary thinness, will do more than return the money laid out with full interest. Supposing none of the thinnings taken out the first five-and-twenty years to be worth any thing, and that there are at that time four hundred more than the number which will have room to stand till they reach their full size, and that these four hundred being cut during the next ten years, sell at 6d. each, one with another, their price will amount to L. 10, a sum more than double what will be necessary to clear all the expenses laid out on the plantation from first to last. The above calculation is intended for land that is neither of the best nor worst kind that we meet with in our moors, but of a medium quality; and it is designedly made so as to fall below, rather than exceed, the truth. Where the soil is of a quality adapted for the more valuable kinds of timber, or even fertile enough to bring firs to their maximum size, much greater profits will be returned." Thus it appears that, by a judicious and economical expenditure of capital, the value of such lands may be increased much more than a hundred times, besides the collateral advantage afforded by shelter, and the improvement of the surface. Surely none but a very prejudiced or a very

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foolish person will maintain that the system of forest management is a bad one, which can produce such a result.

Before closing these remarks, too much extended perhaps, but still only touching on this extensive and important branch of rural economy, we are gratified by being enabled to notice the establishment, in Ireland, of an *Arboricultural Society*—the first we believe of the name—for the purpose of promoting planting, and the care and management of wooded lands in that country. This Society is instituted under the patronage of the Lord Lieutenant, and is supported by the Duke of Leinster, and other noblemen and gentlemen of Ireland. We cordially wish success to a measure of so happy a tendency. In no part of the kingdom is a more favourable combination of circumstances for the extension of forest-culture presented to the planter than in Ireland.

PARLIAMENTARY PROCEEDINGS—REDUCTION OF TAXES.

THE meeting of Parliament was looked to by reflecting men with a solicitude proportioned to the interest of the subjects to be discussed, the importance of the financial measures which were to be proposed, and the intemperance with which, under the pressure of real suffering, or the agitation of party feeling, the most violent projects were about to be forced upon the attention of government. The result, as regards the reduction of taxes, is now known to every one. The taxes proposed to be repealed are the following:

The Duty on Beer, amounting annually to about	L. 3,000,000
on Cider, amounting to	30,000
on Leather, amounting to	370,000
	<hr/>
	L. 3,400,000

In announcing his plans of finance, the Chancellor of the Exchequer stated, that the subject of a property-tax had been under the consideration of Government; but that his Majesty's

ministers deemed the measure inexpedient, and were desirous of affording relief to the country by a remission of taxes, rather than by a change of the burden from one class of the community to another. In this respect we think that his Majesty's ministers have judged well. A tax on property must also embrace a tax on income; for it is a principle which can never be conceded, that the capitalist is to be taxed, and the receiver of revenue exempted. The taxing of capital, however, would only tend to drive capital to other countries, where it would not be taxed. On this account, a tax on property would probably be one of the most injurious that could be imposed; and, as regards a tax on revenue, have we forgotten already all the heart-burning to which it gave rise while it existed, and all the inquisition which it renders necessary, into the most delicate and private concerns of individuals? Such a tax, we conceive, would be a bad substitute for those indirect taxes, which are paid upon commodities consumed; which, being levied in small quantities, are less sensibly felt by the payer; which can be raised without exciting perpetual irritation; and, more than all, which have been found by experience to be the only means of producing and sustaining a revenue.

With regard to those changes which, in the mean time, it is the intention of Government to carry into effect, we have few remarks to offer, after the full consideration which we bestowed upon the subject of the Malt and Beer duties in our last Number. We then exposed the unequal, and therefore unjust, pressure of the tax on beer, operating upon the poor, and exempting those who are rich enough to manufacture the material for themselves; and we recommended that, in the event of the finances of the country not admitting of its repeal, it should be added to the Malt Duty, and thus made to fall upon all the consumers of malt liquor alike. We are gratified to find that our expectations have been exceeded, and that Government has conceived itself enabled to repeal the Beer-duty entirely, without imposing any further tax upon the country beyond a very moderate addition to the duty on spirits of 2d. per gallon in Scotland, and 1s. per gallon in England. We should not have been sorry to have seen a somewhat greater increase of this duty; yet we are

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pleased to see a step towards imposing a further tax on a commodity, on which, on many accounts, we conceive it to be desirable that the greatest possible tax should be levied. This imposition of a further duty on spirits is now exciting considerable attention throughout the country, and, amongst the other grounds upon which it is resisted, is this, that the duties on British spirits and rum, will be made to bear such a proportion to each other as to give an undue preference to the home consumption of the latter. Now, this is a question in which the Irish and Scotch distillers, as well as the English, have an important interest; because, although in the present state of the duties, it is only in England that the relative duties on rum and home-made spirits would, by the proposed measure, be brought into competition with each other; yet, now that the English market is open to the Scotch and Irish distillers, and that a large export trade to England is carried on, any measure calculated to affect the consumption of England would directly affect the other two kingdoms. The duty at present payable on home-made spirits in England is 7s. per gallon, while that on rum is 8s. 6d., so that the addition of 1s. to the former would place the two duties nearly on the same footing.

Now, although in our last Number we recommended an increase of the duties on British spirits, as a measure calculated to benefit the country generally, we by no means did so, in the understanding that rum or any other spirit should be permitted to enter into a competition with native spirits, which did not before exist. If the proposed increase of duty on British spirits, therefore, is not to be followed by a corresponding increase of the duty on rum, we conceive that ministers will act unfairly towards the distillers and agriculturists of the country. The distillery, though not of equal importance with the brewery, as we before showed, as a means of consuming agricultural produce, is yet of great importance, the annual consumption of grain in it being, by computation, about 1,600,000 quarters. Any measure calculated to lessen such a source of demand, must, in that respect, be injurious. Now, while an increase of duties on British spirits may be supposed to produce a beneficial result, by restraining the use of ardent spirits; yet it were a manifest in-

justice towards both the distillers and agriculturists, to adopt a measure, which, while in its ordinary operation it tends to limit their trade in the home market, at the same time inflicts another evil, by subjecting them to a competition which did not before exist. Every alteration of duties on articles of import or of consumption in a trading country, more or less affects capital flowing in particular channels of trade; and there is surely no trade that has been tampered with in this manner to a greater extent than the distillery of Great Britain, which may be said to be just recovering from the effect of the changes of the law on the late reduction of duties. When the law in Scotland was altered in 1823, the duties on the occasion being reduced, and other facilities afforded to the trade which did not before exist, it is known that an excessive overflow of capital into the distillation trade of that country took place, to the grievous injury of those who were formerly engaged in it. The misery which followed the bankruptcy of nearly two-thirds of the owners of the newly erected works, should be a warning to ministers of the expediency of again unnecessarily interfering with this interest.

If the colonies are to be relieved by any measure of the Legislature, let this be by a reduction of the sugar-duty, of which, as it is a high one, a diminution would be calculated to increase the consumption, without materially affecting the revenue. But a relief thus indirect, at the expense of other important interests of the community, we should regard, in the first place, as unjust towards the mother country; and, in the second, as bad with respect to the colonies, seeing that a better mode of relieving them exists. Nay, we should say that it were a disingenuous mode of effecting the end proposed, inasmuch as that the sense of the country being, on grounds of public good, favourable to an increase of the duties on spirits, this proposed measure would seem to be a covert method of affecting another object under the sanction of public feeling.

But we have heard all increase of the duties on spirits objected to, on the ground that it would reproduce smuggling, without at all influencing the consumption; that the last reduction of duties has merely had the beneficial effect of substituting lawful for illicit distillation, and that increased consumption, as

shown by the official accounts, is indicative only of the suppression of smuggling. This argument has been applied particularly to Scotland, with regard to which, it is further contended that an increase of duties would be peculiarly injurious, as placing the Scottish landholders in the unfavourable situation in which they stood previous to the reduction of the duties.

Now, in Scotland, the number of gallons of spirits which paid duty was, in the year 1823,	1,915,579
And the quantity exported to England was	858,298

While, in the year 1829, the quantity entered for home consumption was	5,716,180
And the quantity sent to England was	3,232,513

It thus appears that the manufacture of spirits for the English market has been nearly quadrupled in Scotland since the year 1823, while the internal consumption has been apparently trebled. Now, supposing that the whole of this increased internal consumption in Scotland is apparent, and to be accounted for by the suppression of smuggling, it will readily appear, that the benefit derived by Scotland from the alteration of the duties, has been the opening of the English market to every distiller in the country, in place of its being confined as formerly to one or two monopolists. But an increase of duty does not imply the shutting of the English market, and would therefore be far from replacing the Scottish landholders in the unfavourable situation in which they were before the last reduction of the duties, as the benefit of that change in the law, which threw open the English market, would still remain.

But, with regard to the assertion so confidently made, that the whole of this apparent increase in the official accounts is merely indicative of a suppression of smuggling, and not of an increase of consumption, how is this established? Will any man credit it for a moment, who sees around him the multiplied proofs of that increased debauchery which has manifestly taken place in Scotland since the reduction of these duties, and which seems contaminating the hitherto sober population of the country. It is not true that the consumption of ardent spirits has

not increased, and increased very greatly in Scotland. If we distrust the evidence of our senses in every town, and in every hamlet, we shall find the proof in the official returns of the increase of licences, and multiplication of retailers of whisky throughout the country.

We are rather surprised, that those who are fond of dealing in general reasoning, without paying that attention which could be desired to the facts upon which it is founded, should have employed this argument. We should have inferred, *a priori*, without appeal to facts at all, that the great decrease of duty would have produced a great increase in the consumption of ardent spirits. Those who, in support of their own theories of taxation, so constantly employ the argument, that a diminution of duty causes an increase of revenue, should not be so ready to propound an opposite doctrine in the case of ardent spirits, of all commodities the most likely to be consumed by the working classes in greater quantity in proportion as they are more cheaply obtained.

Granting, then, for a moment, in opposition to the knowledge of every retail trader in spirits in Scotland, that the consumption of ardent spirits has not increased, would it not follow, that, in this case, the landed interest of Scotland can have derived no benefit from the measure of reduction, in so far as the internal consumption is concerned, and consequently would receive no injury from an increase of the duty? It matters nothing as regards the consumption of barley, whether the spirits are produced by smugglers, or licensed distillers. Nay, it is known, that a smuggler invariably uses more grain in producing a certain quantity of spirit than a regular distiller. If the argument referred to, then, is meant to serve the interest of the growers of Scotland, it is a bad one. If they have been benefited at all, it can only have been by the consumption of the country being increased in the same manner in which the trade to England had been increased.

With regard to the decrease of smuggling in Scotland, we contend that it is in no degree indicated by the official statement of duties to which we have referred. We never heard it contended that illicit distillation existed in England previous to the late reduction of spirit duties; yet what has taken place there since

the adoption of that measure? The consumption has been doubled, it having been in 1823, 8,699,826 Imperial Gallons; in 1829, 7,769,694. Are we to credit the absurdity, then, that while a reduction of the duty has thus obviously increased the consumption in England, it has not had a similar effect in Scotland?

But Ireland, it has been argued, affords a striking instance of the advantages of the reduction of duty, in producing a reduction of smuggling. The quantity of spirits in that country which paid duty in 1822, was *Imp. Galls.* 2,328,867 when the duty was 5s. 6d. per Irish gallon, or about 6s. 7d. per Imperial gallon; while in 1828, when it was only 2s. 10d. per Imperial gallon, the quantity was 9,987,908

It is doubtless true that this result is to be accounted for, to a considerable degree, by the suppression of illicit distillation; but it is absurd to say that no increased consumption has at the same time taken place. If the price has fallen, (as it has done from 10s. to 6s. 3d.), it must follow, as a consequence, that the consumption has increased. A reduction of price cannot operate on consumption in Ireland differently from the manner in which it has operated in England. And what would the fact, as regards Ireland, prove, even were it admitted that there had been no increase of consumption? It would only show that, while the state of the excise and police of a country may render it practicable to levy a low duty, a higher one may be evaded. So long, however, as it is matter of fact, that a high duty can be collected in England, without producing the demoralization which has been so much the theme with relation to Scotland and Ireland, we can see no reason for thinking otherwise than that as the excise and police of the two countries improve, a gradual assimilation of duties in the three kingdoms may take place.

Further, as regards the effect of an increase of duties in promoting smuggling in Scotland, we have to observe, that after the close of the war, the state of the Highlands of Scotland was peculiarly favourable to the encouragement of smuggling. A great number of people were then thrown idle on the country, and the excise regulations at that time in regard to the distillery were peculiarly defective, and unfavourable to the making of

spirits of good quality. The regulations are now very different, and the quality of spirits made by the licensed stills is such as to have reduced the premium on smuggled whisky, in the present day, to almost nothing; whereas, before the improvement in question, a premium of many shillings per gallon was readily given. This circumstance was a far greater inducement to smuggling than the high duty, and the disappearance of smuggling must be traced to the improved state of the excise, and to the establishment of numerous licensed distilleries throughout the various districts of the Highlands, which have now therefore the means of being supplied with good and well-made spirits. These are circumstances, we conceive, which have done more to annihilate smuggling than the reduction of the duties; and they are the best safeguards against its recurrence. An increase of duty on spirits, then, to the extent now contemplated, and to a much greater extent, will not, as has been so eagerly contended, reproduce smuggling.

The measure of a repeal of the beer-duties more immediately affects England than the other portions of the kingdom. In England, the consumption of malt liquor paying beer-duty, amounts to upwards of L. 80,000,000; while in Scotland it does not much exceed half a million. The remission of a tax of three millions annually undoubtedly appears to be important to the labouring classes of England; and yet we showed that the practical result in the decrease of the price of beer to the consumer would be extremely small; and with regard to the benefit accruing to agriculture by the measure, we showed that it could be neither immediate nor great, and that an entire fallacy existed in the argument so strenuously urged upon the country, that the consumption of barley would be greatly and suddenly enlarged. When the war duty on malt was discontinued in 1816, it was a remission of tax on the beer consumed in the country of very nearly L. 3,000,000; yet its repeal was followed by no perceptible increase of consumption. Again, when the additional duty of 10s. per quarter was levied during the years 1821 and 1822, no diminution of consumption took place, nor has the discontinuance of this tax since that time had any effect in increasing the consumption.

While, therefore, we do not anticipate those effects which the

country has been taught to ascribe to a repeal of the beer-duty, we admit that the measure is a proper and a wise one. It removes a tax oppressive, because it was partial; and even as regards the agriculturists it will not be without certain advantages. When formerly treating of the beer-duty we showed that, as regarded the consumption of barley, the brewery was superior in importance to the distillery. A diminution of the tax on beer, in combination with the increase of duty on spirits, places the relative taxation on spirits and malt liquor on a better footing,—nearly on the same footing on which it stood previous to the last reduction of the duty on spirits. The reduction of the duty on beer, then, comes in aid of the increase of the duty on spirits, to preserve a profitable source of demand for the raw produce of the country.

Coupled with the reduction of the beer-duty, the Chancellor of the Exchequer announced his intention of submitting to Parliament the expediency of throwing the trade in beer entirely free, so as to give facility to the sale and manufacture of the commodity by abolishing the licensing system, and what is termed the brewers' monopoly. The effect which these had on the consumption of malt liquor we endeavoured in our former paper to elucidate, and our conclusion was, that their operation was not such as was represented on the quality or price of beer. We showed by a comparison of the state of the trade in England where the system did exist, and in Scotland where it did not exist, that neither the price nor the quality of beer was affected in the manner supposed by the operation of the existing system; and consequently that a change of this system to that of a perfectly free trade would not materially influence the consumption; and we have seen not the slightest reason to alter this opinion.

The bill which has been brought into Parliament by Mr Calcraft, founded on the resolutions of the Select Committee of the House of Commons, has just reached us. By this it appears, that the retail trade in beer is to be thrown entirely open to every one taking out an excise license, on paying the sum of two guineas. This license, however, is not to entitle the party so licensed to receive any license to sell, by retail, wines or spirits in the manner in which the present beer license does, the sale of these being still strictly prohibited. The usual penalties for

selling without a licence are to be enforced, and those permitting drunkenness or disorderly conduct in their houses, are, on conviction before two Justices, to forfeit not less than 40s., nor more than L. 5 for the first offence; and on conviction of a second offence within twelve months, the penalty is not to be less than L. 5, nor more than L. 10; and for a third offence, committed within eighteen months, the penalty is to be not less than L. 10, nor more than L. 20. The Justices have then the power of disqualifying the offender from selling beer by retail for the space of two years, as well as the power to adjudge that no beer shall be sold in the same house for a like period, should they think fit. Heavy penalties are enacted in case of adulteration being proved, with the same disqualifications as in the case of disorderly conduct. And all penalties on recovery are to be paid, half to the informer, and half to the poor of the parish.

Looking at the proposed measure in its present shape, it is impossible not to perceive, that the practical effect of it will be to throw the trade in public-house keeping in England entirely free. For, although the bill provides that the beer-license is not to entitle the publican to receive a spirit-license, we regard it as practically impossible that there should exist, in the same country, two distinct classes of public-houses, the one for the beer-drinkers, and the other for the gin-drinkers. If the former are to be prohibited from selling spirits, it is plain that the most strict system of excise surveillance will not prevent them from doing it clandestinely. Such an inference is sufficiently warranted by a reference to Scotland, and the time when the unequal rates of licenses for selling foreign wines and spirits, and British spirits, rendered it impracticable for most of the small publicans to take out the former. The consequence was, that all these houses sold foreign spirits without a license, and this in spite of the utmost vigilance on the part of the excise, and of the innumerable informations to which the offenders rendered themselves subject.

After the consideration which we bestowed upon the general question as to the comparative advantages of restriction or no restriction in the trade of public house-keeping in our last Number, it is unnecessary for us again to say much on the subject. Our consolation is, that the proposed measure is not to ex-

tend to Scotland, where, after experiencing the benefits of this species of freedom, we have been glad to receive a law, which gives the power of restricting what experience has proved to be a real nuisance to society. And it is not a little singular to observe, that, while the public authorities of Scotland are setting forth in proclamations the evils attending the increase of licences, and intimating that many of those at present in existence must be discontinued, while no new applications will be received, the Government should be legislating for another part of the country, apparently for the very purpose of entailing upon it the nuisance from which in Scotland we are endeavouring to escape. What difference, we would ask, is there in the situation of the two kingdoms, to warrant the belief that small public houses will not, under similar laws, increase in England as they have done in Scotland? General reasoning, however ingenious, is of little avail where facts stand in opposition to its conclusions; and we are very certain, that had proper measures been taken to examine those in official situations, and who have the best means of knowing the evils attending the class of houses to which we allude, the Ministers of the Crown would have paused before they made an experiment in England, of what has already been proved to be so injurious in Scotland.

As to the general argument on this subject, that freer competition will lower the price to the consumers, and that those respectable traders who sell the best article will command the trade, we have to remark, that however incontrovertible this proposition in general terms may appear, it is not supported by fact, in the case of public-houses, as evinced in Scotland. Every one knows that this class of houses is supplied with goods of the worst quality, and at the highest price—it is matter of fact, that, under these disadvantages, they do get customers among the poorer classes to purchase of them; and this establishes beyond dispute, that the practical effect is to take from those who are least able to pay, a greater price than is exacted by the more respectable dealers. If these houses have been found by experience at the same time to be a nuisance to society, can there be a shadow of reason for calling them into existence?

If the evidence taken before the Select Committee goes to prove that the English Justices have abused their power in li-

encing; it is the best of all reasons for taking it from them, but none for removing every restriction in the trade; and we certainly think, that the numerous provisions which it is intended to pass into a law, as a substitute for the restraining power formerly possessed by the Justices, will, besides being ineffective, be a greater source of grievance to the country. Surely some mode of controlling the power of Justices would have been better; or some measure might have been adopted, which, while it allowed freedom in the sale of beer, would prevent it from being consumed on the premises of the seller.

In thus considering the present licensing system, we attach no weight to the circumstance of brewers or publicans having invested large capitals in the leases of public-houses, and which will now be depreciated, to the great loss of those individuals. Such investments received their stability from the opinion of the Justices for the time being alone, who had the power either of refusing a renewal of the licence to any particular house, or further increasing the number of licences, so as to influence the value of the houses in any district. Capital thus invested, therefore, cannot be said to have been done so under the faith of existing laws, but merely on the faith of every succeeding bench of Justices, taking the same views as to the fitness of particular houses, and the number of houses necessary for the supply of particular districts.

But while we do not hold that the circumstance, that those at present in the trade suffer a severe pecuniary loss, furnishes an argument against the adoption of a freer trade in beer, if found to be otherwise desirable, we certainly do regard this circumstance as an argument against an *experiment* such as the proposed measure avowedly is. We formerly showed that nothing could be a greater fallacy than to suppose that the increased value of the licensed public houses formed a tax on the consumers of beer. The depreciation of that value, therefore, will not benefit the public, but go directly to those who enter into the trade under the new law; and surely an experiment which is thus to have the effect of transferring a large amount of property from one class of the community to another, should have been better considered than the present intended measure appears to have been. Such a destruction of private property

can only be justified on grounds of obvious expediency, as regards the community ; and the present case is a widely different one from that of a reduction of price by the opening up of a monopoly, with which we are surprised to see that many of the public prints, otherwise acute in their reasoning, have confounded it.

With regard to the other duties proposed to be repealed, namely those on cider and leather, we have to observe, that the former is of small importance generally, though it will be sufficiently appreciated in the districts where that liquor forms an article of manufacture ; and as to the latter, seeing that it was formerly partially remitted, while the same expense was still incurred in the collection of the remainder, the total repeal was judicious and proper. The tax was objectionable in principle, as affecting a large manufacture in a manner more hurtful to the manufacturer than useful to the revenue, though, considering the moderation of the tax itself, we do not consider that its repeal will be sensibly felt by the consumer.

Our conclusion is, that the taxes repealed will not produce that effect on the industry and consumption of the country, which so large a remission of duties may seem calculated to produce. Yet we do not condemn the measure as bad, merely because it will not produce all the good which many look for. A like objection might be applied with more or less force to the repeal of all taxes. We have seen twenty-seven millions sterling of these taken off within a few years, without that effect on the prosperity of the country, which, we may presume, would have been produced, had all the evils of the country resulted from its taxes. But although the good may be sometimes overrated, which a repeal of taxes produces, it is not the less a duty which government owes to the nation to use every practicable means of reducing them. We think that his Majesty's ministers have performed this part of their duty with a zeal and good faith, which merit the approbation of the country. They have made a large remission of the burdens most complained of, and have brought into operation a steady system of retrenchment, carried, we apprehend, in many cases to its limits. They have applied themselves to the task of repairing the errors of their predecessors, and have opposed many mistaken plans regarding

the finances, the currency, and commerce of the country; to which, perhaps, they might have yielded in certain cases, with a gain of popularity and acquisition of political adherents.

We do not think that any men could have done more within a period so limited, to economize the public revenues, and lighten the burdens of the people. Differences of opinion will, doubtless, exist, when the question is so debateable as that which relates to the best mode of affording relief by a reduction of taxes. Some will argue that other taxes than those on beer, cider, and leather, should have been first attended to, as those on timber, hemp, and other commodities connected with shipping and commerce. They at least are not entitled to use this argument, who have been busy in exciting public feeling by exaggerated statements of the effects to be derived from a repeal of the duties affecting malt liquors. We are of opinion, certainly, that a repeal of the duties on malt liquors (one of the most moderately taxed of all our exciseable commodities) might safely have been postponed in favour of others more directly affecting the industry of the country. But we have seen how eagerly a repeal or modification of this class of taxes has been demanded; and it will hardly be contended, that, in a country like ours, the expression of public feeling ought to be disregarded or despised. If this concession to the general opinion shall be attended with the effect of allaying that irritation which prevails, it will be well. Let those, however, who can influence the opinion of others take heed, how, for the purposes of party, they trifle with so dangerous an engine as public feeling. The errors which they countenance may be turned against themselves in matters more important than the repealing of a tax; and, assuredly, the spirit displayed at some of those public meetings which have been recently got up, if it be not a dangerous one, is little consistent with the sober sense and right feelings of English gentlemen.

Few appeals to popular feelings are more generally successful than those which relate to a reduction of taxes; and yet a reduction of taxes, as much as the imposing of them, often involves considerations of great difficulty. Not a tax can be changed without affecting the subsisting relations of capital in some branch or other of industry and trade. It is in the highest degree im-

portant, therefore, to give steadiness and consistency to any system of fiscal regulations; and when changes are resolved upon, that they be carried into effect with as little displacing as possible of capital from its established channels. To do otherwise is unjust to the capitalist, and injurious to industry; and those who approve of great and sudden changes in finance, show themselves to be little conversant with practical business. Whatever reformation, then, our fiscal code may demand, we hope to see carried into operation temperately, for then only will it be done wisely. Such a course, we feel assured, will lead to a more favourable result than sweeping plans of financial change, founded on principles, true perhaps in the abstract, but false, because subject to limitations and exceptions, when applied to the actual state of the country.

Notwithstanding the many ridiculous and contradictory opinions regarding the state of the country, recently expressed in Parliament, it is certain that sounder opinions on the subject of finance have been gaining ground. Not only the detail of our public expenditure is incomparably better understood than formerly, but more statesman-like views have been developed and rendered familiar. The Treasury has been at length assailed by the force of opinion; and whatever errors may now be committed in the financial measures of the country, we may feel assured that they will be no longer the blunders of the Vanittarts of former administrations. The error of the present time is rather to systematize too much, than to resist all useful change, and cling to narrow and exploded opinions.

Amidst so many deplorable proofs of general distress, it is consolatory to observe such indications of reviving industry as are calculated to remove much of that anxiety which every thinking man must have experienced regarding the state and prospects of the country. Great as the difficulty and embarrassment in every branch of national industry have been, there is reason to believe, that, as regards the trading and manufacturing classes at least, they are gradually giving way, and that soon the traces of them will have disappeared in a renewal of confidence and credit. Should these expectations be realized, we have to express our hope that the opportunity will not be lost of amending all that may be amiss in our financial system, lop-

ing off extraneous expenditure, and lightening the taxes where they press the most on productive industry. A period of public prosperity is better suited for such a purpose than one of distress and general excitation. We are too late for the business of reform, when we wait for those revulsions in industry, which are seen to have been periodical. Our endeavour should be, if not to prevent the recurrence of such revulsions, to provide, as far as we can, for their consequences when they arrive. Let us remember that peace is the precious time for husbanding and improving our resources, and that no sagacity can foresee how long we may be spared the calamities of war. Let us, in the mean time, be spared the evils of hazardous experiments on currency and trade—on the laws affecting the supply of capital and the protection of domestic industry. Let us have a respite from experiments. Let us have no more *prosperity speeches*; and let the watchful jealousy of the public be as much excited to prevent a heedless or venal expenditure of the public resources as in times of difficulty and trouble.

We have spoken of the evidences of reviving industry; but we do not refer to these as the evidences of returning high prices. The statements of the exports of the country recently laid before Parliament, show, that while the commodities exported have increased greatly with relation to quantity, they have diminished greatly with relation to value in money; and that we actually, at this time, export a less amount, valued in money, by many millions Sterling, than we did fifteen years ago*. Now, this value, with relation to money, shows the value of goods in the general market of the world. It shows a diminution of prices not confined to our own country, but extending to all countries with which we carry on an intercourse. It allows us

* By the return of exports of British and Irish produce and manufactures from Great Britain, it appears that, in the year ending the 5th of January 1815, the official value of exports was . . . L. 33,200,580 0 0
And the real or declared value, . . . 43,447,373 0 0
That, in the year ending the 5th of January 1830, the

official value was . . . 55,465,723 0 0
And the real value . . . 35,212,873 0 0

But, according to what is termed the official value, the price or value in money remains always the same, so that the difference in the official value of exports at different periods, correctly indicates the difference in the quantity of goods exported. Now, the increase from 1815 to 1830, was in the proportion of 33,200,580 to 55,465,723, or a fraction more than 67 per

to draw this inference, that the fall in the price of goods arises from causes that are general in their operation, and affecting other countries, and not from causes that are partial in their operation, and affecting exclusively our own country. This fall in the price of goods extends to every country in Europe, to America, and our Colonies. The fact affords a decisive answer to the argument, that the fall in the price of commodities at home is to be wholly ascribed to the change of the currency at home. This general diminution of prices has taken place in countries which any measures of finance here can affect only indirectly and inconsiderably. If it shall be said, in answer to this, that this fall of prices has taken place in consequence of increased production—of a *glut*, as it is termed,—the answer is obvious. This glut has not been produced by operations in our monetary system. These, in so far as they may be supposed to have affected productive industry injuriously, must have operated in an opposite direction, and tended to retard, and not to promote, increased production.

Political economists have laboured to show that there can be no general glut of commodities. Now, we entirely agree with the reasoning employed by M. Say, Mr Ricardo, Mr McCulloch, and others, that there can be no general glut of commodities,—provided we include money in these commodities. If the quantity of all commodities shall be increased by increased production, including money, then no man, whether he holds money or goods, will be in a worse situation, but all men will be in a better situation, by increased production. But if money shall not increase in the same ratio, there may be, in the language of merchants, a *glut* of commodities. Now this, we apprehend, is precisely what has occurred at the present time. There is a *glut* of commodities which we may very clearly trace to the increased powers of production by improved mechanical means, to the readier intercourse between countries, and to the facilities afforded to increased produc-

cent. But the goods represented in 1815 by 33,200,580 were worth, according to the declared value,	L. 43,447,373	0	0
And the goods represented in 1850 by 55,465,723 should, in the same proportion, have been worth	72,584,272	0	0
But their real or declared value only is	36,212,873	0	0
And hence there is a fall in the money-value of the goods of about 48½ per cent.			

tion by a return to peace, in consequence of which a great proportion of the inhabitants of every country has been turned from consumers to producers,—from unproductive to productive labourers. There has therefore been a general increase in the production, and means of supply, of commodities, without an increased production in the supply of the precious metals. Nay, there has been a great diminution in the supplies of the precious metals, arising from the troubles in the countries where the mines are situated. There being, therefore, an increased production of goods, without an increased production of money, there has been a fall in the money price of goods, throughout the whole world. Nay further, this fall in the money price of goods may be presumed not to be of a temporary nature, because it does not arise from causes that are likely to be so. There is no reason to suppose that the powers of industry and invention, and consequently the means of production, are to stand still. We may rather infer the contrary; and then we arrive at the conclusion, that there is no reason to suppose that an increase in the money price of goods is likely to take place.

This view of the effects of the increase of the powers of production affords subject for serious and interesting reflection, both as relates to the state and prospects of our own country, and to the state and prospects of other countries. Our limits, however, will not allow us at present to enter into this field of discussion. We think that, reasoning from the data referred to, we could establish some inferences as regards the trade and finances of the country, of some interest, and perhaps of some novelty; and we may perhaps resume the subject at a future time.

In the mean while, we address these remarks, in an especial manner, to our agricultural readers. We entreat of them to bear with us patiently when we chance to take views that may differ from their preconceived notions. We assure them that our warmest wishes are connected with their welfare, and that all the habits of our life lead us to take a deep interest in what concerns the prosperity of agriculture. We greatly deplore the unmerited calamities which afflict so many worthy men. We have had good means of knowing the effects of that remarkable change by which, in a few brief unhappy years, the whole earnings of a life of industry have been so often swept

away. Cases innumerable have come within our observation, of the cruel condition to which numbers have been reduced, by circumstances which, on entering into engagements with their landlords, they could not foresee; or, foreseeing, could not have provided against, except by living idly upon their funds, or deserting that occupation to which all their habits and wishes led them. Feeling these things, and deeply feeling them, we will not the less speak the truth, though sometimes opposed to more favoured opinions, conscious that one of the truest services we can render to the distressed agriculturists of the country, is to guard them from the consequences of delusion and error as regards their situation, and the means of improving it. We tell them that they are deceived, greatly deceived, in many essential points: That the fall of price of which they complain is a general fall, not affecting the produce of land in particular; nay, affecting the produce of land greatly less than manufactured commodities: that this fall can only be ascribed, in a partial degree, to the changes that have taken place in the monetary system of the country; and, for the proof, they are referred to the state of prices in countries where the effect of these operations has not been felt. We tell them further, that their distresses may arise from the relations between them and their landlords, which no legislation can reach, without annulling the contracts which take place between man and man. We tell them further, that their interests have not been materially affected, if affected at all, by that relaxation of the mercantile system, and navigation laws of the country, which took place under the administration of Lord Liverpool, and to which the name of Free Trade has been absurdly applied.

This measure consisted in a change on the navigation laws, which does in no degree, directly or indirectly, operate on the raisers of raw produce; in a substitution or diminution of duties in the case of imported commodities, instead of entire prohibition, or duties prohibitory in effect though not in name; in the removal of certain restrictions on the details in trade, chiefly of a fiscal nature, embodied in numerous acts of Parliament, and forming a system of commercial regulation, so perplexed and vexatious, as to have long been the subject of remonstrance with the whole mercantile world. A mass of these fiscal laws was repealed in one act of Parliament, and the wonder now is, not

that they should have been at length repealed, but that they should have been suffered so long to perplex and disgrace the mercantile code of the country. To these measures, we tell our agricultural readers, that the term Free Trade can in no sense be applied. Unhappily for the interests of mankind, free trade does not and cannot exist in the intercourse between trading nations. Considerations of revenue, independently of all other circumstances, are sufficient to modify and limit the principle of free trade, even where trade is most free. In no country is trade free, and in England so far is it from being free, or approaching to that state, that there is no production of foreign countries that is not loaded with restrictions, under the form of duties and fiscal restraints, in favour of native produce. The question about which so much unprofitable and angry discussion has taken place, is not whether the abstract principle of free trade shall be applied to the commercial system of England, but whether certain changes which had been deemed expedient in that system have been beneficial or otherwise. The application of the abstract principle may be contended for perhaps by speculative writers, but will receive no countenance from men of practical knowledge. If our agricultural friends will turn to the vindication by Mr Huskisson, in the House of Commons, of his principles and policy, they will find that even he gives no support to the abstract principle of free trade; or, if they will refer to the recent observations of the Duke of Wellington on the corn laws, they will see how little favour such a principle meets with from the present government of the country. Whether the measures referred to were carried into effect with sufficient caution, has been questioned, and, we conceive, reasonably questioned; but no one ought now to contend for a return to the former state of things. A great outcry has indeed been raised on the part of particular trades, whose interests have been supposed to be more immediately affected; but it is known that consequences have been ascribed to the measures, which, assuredly, have not resulted from them; and that facts and documents, accessible to every one, are entirely opposed to the inferences which the statements put forth are intended to establish. We find, indeed, a great decrease in the price of commodities in the trades in question; but this, we have seen, does not apply to one class of traders, but to all—to one country, but to many.

MISCELLANEOUS NOTICES.

1. *On the Manufacture of Macaroni from Wheat*.—I went the other day to visit a *fabbrica* of macaroni, which may well be styled the Italian's staff of life. I never could understand why in England we should be indebted to Italy for so useful and wholesome an article of food, and I confess myself to be still in the dark upon the subject. No one will deny that the finest wheat, if not grown in England, may always be obtained there; and it is idle to suppose that skill is wanting for its proper manufacture. The process is very simple, and though it is not easy to explain machinery without a diagram, I shall endeavour to set it, to all-intents and purposes, clearly before you. I should first apprise you that the finest flour is alone employed in the making of macaroni: this is mixed with as small a quantity of water as will suffice to convert it into paste; it thus becomes much too hard and consistent to be kneaded with the hand, and in order to its being done effectually, the following contrivance is resorted to. A wooden pole, about fourteen feet long, is fastened at one end to a post driven into the ground, by a chain, so as to be lifted up and let down again with ease. Near the post to which this is fastened, stands a low platform on which the paste is disposed, and that part of the pole which is immediately over the platform is prism-shaped, so that it comes in contact with the paste in the form of a thick wedge. At the other extremity of the pole are stationed two men, whose employment is to keep moving it to all parts of the paste, and pressing it down with their united weight, which at a distance of ten feet as they are from the paste-board, acts with very considerable effect. When the paste is sufficiently worked, it is transferred to a hollow cylinder, at the bottom of which is a cast-iron plate perforated with holes—these are of different forms, and hence the variety of shapes in which macaroni appears. Over the paste is what is called in dairy countries a *follower*, or cylindrical piece of wood, exactly fitting the cylinder, and this is forced down upon the paste by means of a screw of great power, worked by two or more men. The paste then issues from beneath through the cast-iron plate, and as it issues very slowly, is partially baked by a fire stationed for that purpose in a semi-circular form round the space immediately below the cylinder. As it descends it is gradually drawn away, and being suspended across the room on rods, it becomes fit for use in a day or two. Such is the simple process of making macaroni—a food wholesome and nutritious; which forms the principal food of the lower orders of Italians, but which in England is only found upon the tables of the rich, owing to the enormous price at which it is sold; and which price is justified on the plea that it cannot be manufactured there. It is my firm belief that if any spirited individual would commence its manufacture on an extensive scale, the Italian macaroni would soon cease to be an article of importation.—*Walker's Letters from the Continent*.

2. *On the Adulteration of Bread*.—Although pure and nutritious bread is so necessary to health and life, there is no article more liable to sophistication. The practice of mixing potatoes with the dough has been already noticed. Potato-starch is used for adulterating flour. A few months since an eminent flour-factor showed me a powder which he said had been sent him as a sub-

stance which might be mixed with flour without discovery, and requested me to examine it, declaring his intention, at the same time, of publishing the transaction. Inspection alone was sufficient to convince me that the powder was potato-starch, and a few experiments soon decided the point. This fraud has no other bad effect than in lessening the quantity of nutritious matter which a given quantity of the bread should contain; beside the extortion of charging full price for an article of less value! Inspection by a high magnifier will detect potato-starch in flour, by its glistening, granular appearance. We have heard of bones, burned to whiteness, and ground to an impalpable powder, being used to adulterate *thirds* flour, which, being of a somewhat gritty nature, will disguise the grittiness, which it is almost impossible to deprive bones of, be they ever so laboriously ground. This fraud is easily detected; for, if much dilute muriatic acid, that is, spirit of salt mixed with water, be poured on such flour, there will be an effervescence or boiling up; and if the liquid be thrown on a filter of paper, the portion which runs through the paper will let fall a white heavy deposit, when pearl-ash is added. Chalk and whiting are also adulterations, which, in small quantity, are often mixed with flour, and, although such admixtures are not noxious to health directly, they are injurious in many ways. They may be readily detected by pouring on a large quantity of dilute sulphuric acid, that is, oil of vitriol mixed with six or seven times its weight of water; if an effervescence ensue, it is proof that there is adulteration, and if, after filtration, as before directed, the addition of pearl-ash to the clear liquor produce no muddiness, or a very slight degree of it, the presumption is, that the adulteration was chalk or whiting. Alum is a well-known sophistication of bread, not used on account of its quantity, but to disguise a bad quality of flour; it is said to whiten ill-coloured flour, and to harden and whiten bread made from flour which has been malted. By some respectable bakers it has formerly been used, and might still be used, if there were not a law against it, with perfect safety; in so small a quantity as half a pound of alum to one cwt. of flour, it could not be in the least degree injurious, for this would be but nine thirty-fifths of an ounce to the quartern loaf. When used in double this quantity, as it often is, it becomes discoverable to the taste when the bread grows stale. Be this as it may, we can easily detect alum in bread, for it is only in bread that it need be suspected, by pouring boiling water on it, letting it cool, pressing out the water, boiling it away to one-third, allowing it to cool, filtering it through paper, and adding to the clear liquor some solution of muriate of lime. If a considerable muddiness now appear, it is proof of adulteration, and none other can well be suspected than alum. Salt, which, in small quantity, is absolutely necessary to the flavour of bread, is used by fraudulent persons as an adulteration; for a large quantity of it added to dough imparts to it the quality of absorbing, concealing, and retaining a much greater quantity of water than it otherwise would. Bread made from such dough, will, on leaving the oven, come out much heavier than it ought, and the additional weight will be merely water. Fortunately the taste of such bread is a sufficient index to its bad quality. It is rough in its grain; and has this remarkable quality, that two adhering loaves will generally separate unevenly, one taking from the other more than its share.

The following account of a new and execrable adulteration has been lately given in Brande's Journal:—"The journals of Holland have for some time announced that sulphate of copper, or blue vitriol, was employed in that country to assist in the fermentation of bread; and, at the same time that they pointed out the dangerous nature of this substance, they said that it was used because it was supposed to render the bread whiter, more compact, more healthy, and better fermented. The magistrates of Brussels caused thirteen bakers and five druggists to be brought before them for being concerned in this adulteration; and it appeared, 1st, That the employment of the process came from France, and that, by the use of *bleu alum*, a better fermented and whiter bread was obtained than by ordinary processes; 2d, That the use of the process was announced in the public journals, and in a prospectus which, being printed, was distributed; and stated that a patent secret for the preparation of *bleu alum* was to be sold, but without describing in what it consisted; 3d, That the bakers inquired for the substance under the term of *bleu alum*, and that the druggists gave, under this name, blue vitriol, or the sulphate of copper."—*Dr Lardner's Cabinet Cyclopædia. Domestic Economy*, vol. 1.

3. *On the Modern Agriculture of the Eioia*.—The chief produce of the arable lands of Gastúni is flax, wheat, and two kinds of holcus, both called Kalam-bókki; namely, maize and the dhurra of Egypt, called, from the smallness of the grain, Small Kalambókki. For flax, the land is once ploughed in the spring, and two or three times in the ensuing autumn, with a pair of oxen, when the seed is thrown in and covered with the plough. The plant does not require and hardly admits of weeding, as it grows very thick. When ripe, it is pulled up by the roots, and laid in bundles in the sun. It is then thrashed to separate the seed; the bundles are laid in the river for five days, then dried in the sun, and pressed in a wooden machine. Contrary to its ancient reputation, the flax of Gastúni is not very fine, which my informant ascribes to its being exposed to the cold and running water of the river, instead of being soaked in ponds. It is chiefly used in the neighbouring islands by the peasants, who weave it into cloths for their own use. The wheat grown in the plain is the hard red wheat called Ghiriníá. In the hills, the white kind of Rusiá is used. Land being plentiful, there is no regular succession of crops, and a fallow of two years is common. New land, or fallow, is ploughed in the spring; and, if there is rain, it is sown, at the third ploughing, with cotton, kalambókki, and sometimes with aniseed. Wheat, on secondary land, is sown in October, on the richest in November, December, and sometimes as late as the middle of January, if an excess of rain prevent its being done before.

The proportion of seed is usually half a vatséli, or measure of thirteen oke (an oke being 2½ lb. avoirdupois) to a strema, or square of nineteen fathoms the side. A fall of rain in March, and another in April, are reckoned sufficient; if there is more, thistles, tares, centauries, and golden thistles, gain head, and choke the corn. The other plagues are a black-winged insect called Vromúsa, from its bad smell, and rain in May, which injures the blossom. Harvest begins about June 10th, in the plain; in the hills it does not finish generally till July 20th, or beginning of August, new style. The grain is trodden out on the thrashing-floor by horses, when the Mukátasi takes his

titha. Good land produces ten, and sometimes thirteen to one. The corn of Gastáni weighs about twenty-six okes, the kilo of Constantinople. The *kalambókki* of both kinds may be either dry, or irrigated by art; the first mode produces the better grain, the latter the most plentiful crop. Both require the best land. After three or four ploughings in the spring, the seed is ploughed in about the end of April, in the proportion of one *vatzéli* to sixteen *strémata*. The land is then levelled with an instrument called the *Svárna*. This *svárna* is a piece of wood six feet long, and one foot thick, which is fixed to the plough, after the share is taken off, and is driven about the field, while the labourer stands upon it; it breaks the clods, and levels the ground. A very dry summer is injurious to the dry, and a very rainy August to both kinds of *kalambókki*. The harvest begins in the middle of September. The return of maize is thirty or forty to one. The stalk makes excellent fodder for cattle. The small *kalambókki*, is used chiefly for feeding fowls; and the quantity raised is not very great. For cotton the best land is chosen, and that which can be easily irrigated. The seed is soaked in water two or three days, and then mixed and rubbed together with earth, that the grains may not cohere, but may be well scattered in sowings. The seed-time is the same as that of the *kalambókki*, namely, the end of April, or beginning of May, the proportion of seed, half a *vatzéli* to a *strema*: the seed is ploughed in, and the land levelled with the *svárna*; the harvest is in the beginning of September. In the lands of Gastáni, the Greek metayer is at all the expenses, and receives two-thirds of the produce, after the *Mukásati* has taken a seventh for his *dhekatía* or tithe.

A flock of sheep consists of 500, two-thirds of which are ewes: it is attended by three men and a boy, and four or five dogs. Nothing is paid for pasture, except one asper and a-half (the asper being about one-eighth of a penny) a-head to the *Spahí* of the village to which the pasture belongs. The tax to government is now one asper and a half a-head per annum; besides a *para* (the *para* is about three-eighths of a penny) a-head on the fleece. Neither sheep nor goats are ever fed: the pasture is changed three or four times in the summer. The profits of a flock are derived from the lambs, the widders, the milk, the fleece, and the skin. Four rams are sufficient for 100 ewes. In warm situations near the sea, they are put together about July 20th, that the lambs may be dropt about December 20th. In colder places the rams are not admitted till August 6th, that the ewes may lamb about January 6th. In two months the lambs are weaned, but for another month they are allowed to suck a little after the ewes are milked. A lamb that has been fed entirely upon milk for three months will sell at Easter, when the great consumption of lambs takes place, for four, five, or six *piastres*. In March the ewes are separated; and for the three following months are milked twice a-day, then once a-day for a month, and in July, once in two or three days. A good ewe gives at every milking a pound of milk, of which are made butter, cheese, *misthra*, and *yaourt*. For butter, the milk is left twenty-four hours to become *seur*, when it is beaten in a narrow cask with a stick until the butter swims at the top; the butter-milk is then mixed with an equal quantity of milk, and forms the *tyrogala*, or milk for making cheese. Salted rennet is thrown into it when warmed. As soon

as it is coagulated, it is beaten up until it resembles milk again, after which the cheese is allowed to separate, is then put into a form of cloth, or wood, or rushes, and squeezed dry by the hand. The remaining liquid is called *nerogalo*, milk-water.—To make *misithra*. The *nerógala*, after the cheese has been extracted, is placed upon the fire; about a tenth of milk is added to it, and after a short boiling, the *misithra* is collected on the surface. Goat's milk makes the best *misithra*, even though the butter has been extracted from it. *Yaourt*, which seems to be a Tartar invention introduced into Greece by the Turks, is made from the best milk of sheep or goats. To make the *pityá* or coagulum, take some leaven of bread, that is to say flour and water turned sour, and squeeze a lemon upon it, dissolve it in boiling milk, and keep it twenty-four hours. To make the *yaourt*, boil some new milk till it foams, stirring it frequently, leave it till it is cool enough for the finger to bear the heat; then throw in the *pityá*, of which a Turkish coffee-cup full is sufficient to make several quarts of *yaourt*. Then cover it that it may not cool too fast, and in three hours it is fit for use. On all future occasions, a cup of the old *yaourt* is the best *pityá* for the new. The sheep-shearing takes place from April 20th to May 10th; no washing or preparation of any kind is thought necessary; it is performed with scissors. The ewes give about three, the males four pounds of wool, which now sells for about ten paras the pound. About three-fourths of the wool produced in the district is exported; the remainder is wrought at home into coarse cloaks, or into carpeting, or the furniture of beds and sofas. An ewe's or wedder's skin unshorn, is worth thirty or thirty-five paras; a ram's, forty or forty-five paras; a lamb's, ten. The curriers purchase them, make some into leather at *Gastúni*, and send the rest to the islands. The flocks suffer occasionally from wolves and jack-alls. The principal disease of the sheep is called the *Evloghiá* or Plague; it carries off great numbers, but seldom occurs oftener than once in five or six years, and is not peculiar to any season. They have a practice of inoculating for this distemper, by taking a small quantity of matter from an ulcer of the diseased sheep, and rubbing the ear of the still healthy sheep with it; it is confessed, however, that little benefit is derived from this process. If the *evloghiá* carries off half the uninoculated, perhaps 60 per cent. of the inoculated may live. Another disorder is called *Kholiánitza*, which is supposed to proceed from unwholesome food. The *vidhela* is ascribed to feeding in marshy places, in August and September, when it is imagined that an insect from the plant finds its way to the sheep's liver. From the middle of June till the autumn the sheep feed only in the night, and require water once a-day. There are supposed to be about 300,000 sheep and goats in the *Vilayéti* of *Gastúni*, besides which 150,000 come from the mountainous parts of the neighbouring districts in the winter. These pay two aspers a-head to the *Spahí*, instead of one and a half. The proportion of goats to sheep is about a fourth. The uncultivated land serves for the pasture of cattle as well as sheep. The herds of *Gastúni* supply *Zákytho* and the other islands with beef in considerable quantities. In the *Moréa* beef is little used, and they would rather give fifteen paras an oke for goat's flesh, or eighteen for mutton, than ten for beef. But there is a constant demand in the *Moréa* for cattle for the plough, both oxen and buffalos. A good pair of oxen costs 150

to 180 piastres; a bull about thirty-five; a cow sixteen to twenty. When natural fodder is scarce, oxen are fed with wheaten-straw, with the *róvi*, or with vetches and tares, which are sown for the purpose, and plucked up by the roots; but poverty and oppression prevent the proprietor of oxen from cultivating this useful provision for his cattle, and in summer they are almost starved. Like the sheep, the ox is occasionally subject to a peculiar epidemic disorder. On these occasions there are some quacks of cow-leeches who administer an herb, which they pretend to bring from Filiatrá, but, as may be supposed, without much effect. Ox-hides are exported to Zákyntho; but there is a great internal consumption of them here also, as the shoes both of the cultivators and shepherds are made of ox-hides. Corinth is reckoned to possess the best race of cattle, and bulls have sometimes been brought from thence to Gastúni, to improve the breed; but the cattle of *Ellis* are still inferior to those of the *Corinthia*.—*Leake's Travels in the Morea*.

4. *Effect of Light on Plants*.—Vegetable physiology is indebted to Senebier, Saussure, De Candolle, and others, for numerous researches on this interesting subject. M. Glocker, in 1820, published at Breslaw, a work in which he has brought together all the facts known, and even the most plausible hypotheses. M. Leuchs has also lately added some interesting experiments on the same subject. It is known that the solar light, by favouring the assimilation of carbonic acid gas in plants, gives them the faculty of becoming green, and of forming the volatile and aromatic principles. These conditions are necessary to their flowering and fructification, insomuch that ripe seeds have never been obtained from plants kept in darkness. If, on the contrary, bleached plants, are exposed to the sun for three, four or five, hours, they become as intensely green as if they had been reared in the sun. Vegetables reared in the open air, become pale and fade in two or three hours, if they are transplanted to a dark place; but those which, after growing in the shade, have been exposed for some time to the sun, can no longer support the privation of light; and water, impregnated with camphor or essential oil, which is highly favourable to vegetation in other circumstances, does not prevent them from fading and perishing. The entire privation of light is therefore very hurtful to plants. M. Leuchs concludes from this, that, without the light of the moon and stars, vegetables would be destroyed by the influence of the night. The light of a lamp is capable of replacing that of the sun, though in a very imperfect manner. The plant becomes green, and directs itself toward the lamp, as M. Leuchs has shown by a beautiful experiment. He has made comparative observations on the germination of seeds deposited in an open vessel, in another covered with a single leaf of paper, and in a third covered with two leaves. Those of the first vessel presented the least external development; but, on being dried, they afforded the greatest quantity of solid parts. Those of the second vessel were much more developed, but their tissue was looser and more watery. This difference was still more decided in the plants of the third vessel. The length and wateriness of these plants, therefore, increased in the ratio of the diminished action of light. The tissue of various plants seems to become more or less watery, according to the nature of the plants themselves, when they are deprived of light. Proceeding from this fact, M. Leuchs is desirous that the influence of different

quantities of light on vegetation should be determined. He himself has observed, in a moist cellar, lighted by a torch, that the plants placed nearest the flame also contain most solid parts on being dried. The results of the observations which he details are pretty uniform, and afford reason to hope that the law by which the action of different quantities of light on the vegetable is regulated, may yet be determined. Lastly, according to experiments detailed in his memoir, the light reflected by mirrors has a very beneficial influence on plants. M. Leuchs explains by this how certain places are fertilized by the reverberation of the light on rocks in their neighbourhood.—*Bulletin des Sciences Naturelles*.

5. *Diseases of Poultry*.—From a series of observations made on the diseases of domestic poultry, Mr Flourens makes the following conclusions:—
 1. In these animals, cold exercises a constant and determinate action on the lungs. 2. The effect of this action is the more rapid and more severe, the younger the animal is. 3. When cold does not cause acute and speedily fatal inflammation of the lungs, it produces a chronic inflammation, which is pulmonary consumption itself. 4. Heat always prevents the attack of pulmonary consumption: When the latter has taken place, heat suspends its progress, and even sometimes arrests it entirely, and effects a complete cure. 5. Pulmonary consumption is never, in any stage, contagious: Fowls affected with that disease were not only all day along with the healthy fowls, but at night roosted in the same places, without communicating their disease to them. 6. Lastly, the action of too long confined air exposes these animals to abscesses of the cornea, and inflammation of the ball of the eye. These abscesses and inflammations are also caused in a still more cruel manner, by cold, especially when accompanied with moisture.—*Annales des Sciences Naturelles*.

6. *On Cloth manufactured from the Wool of the Cotton Grasses*.—Mr Helliwell of Greenbursst Hey, near Todmorden, has manufactured a beautiful cotton russet cloth, and also yarn for stockings, from the wool produced by the cotton-grass plants found upon his estate there. This plant grows principally on the highest and most useless land in the kingdom, and consists of two kinds, the common or single-headed cotton-grass, *Eriophorum vaginatum*; and the narrow-leaved cotton-grass, or many-headed cotton grass, *Eriophorum angustifolium*—both perennial plants, and from the latter of which the cloth and yarn were manufactured. It is supposed, that on many parts of Stansfield Common, near Todmorden, even in its uncultivated state, there might be from two to three hundred weight produced upon an acre, and that the cost would not exceed 2d. to 3d. a-pound. Specimens of the yarn and cloth have been sent to us, and the cloth is remarkably firm and beautiful. They may be seen at our office.—*Leeds Mercury*.

QUARTERLY AGRICULTURAL REPORT.

IN our last Report we referred to certain circumstances, which were likely to produce an increased demand for corn, and enhance the price during the months of spring and summer. Prices accordingly have somewhat advanced, and there has been more briskness in the trade during the last two months than for a considerable period before. Stocks in granary, in all places, have been diminishing at a season when they ought to have been increasing. Under existing circumstances, the growers cannot have retained a great proportion of their grain, and consumers and dealers have been cautious buyers. The stocks in the principal towns of consumption have not been so low for many years. In London, for example, the stock of free wheat, British and foreign, does not at present exceed 40,000 quarters, and a very small proportion is of good quality; and the quantity in bond does not exceed 120,000 quarters. The average annual consumption of London for the preceding twenty years appears to have been about 600,000 quarters of wheat, and 400,000 sacks of flour. Supposing the arrivals of British supply into the port of London to be 3500 quarters weekly until harvest (and they cannot be calculated at more), the want of foreign wheat for the consumption of London alone will probably be not less than 300,000 quarters. The stocks of wheat in other ports seem proportionally low; and every place, in proportion to its wants, will require a supply in the same manner as London. The short report of wheat from Ireland, and the general demand in the Channel ports, are evidence that much will be wanted in the interior of England. From these circumstances, we infer that a considerable importation of foreign wheat will be required before the ensuing harvest; but the actual amount, and the terms of duty, will of course be influenced by the state of the weather and prospects of the country during the months of summer. At present, the young sown wheat has generally a favourable appearance.

Barley will be found to be very deficient, and a considerable quantity from abroad will be required before harvest. But this will be easily obtained from Holstein and the Danish Islands, as well as from Rostock, Wismar, Prussia and Russia. The crop of oats appears to have been by no means large either in England or Scotland; but Ire-

land will probably make up any deficiency, and afford sufficient supplies during the season to prevent the price from advancing materially.

The following table will show the change in the averages since January, the progressive improvement in the price of wheat, and the trifling change which has taken place in the other grains :

DATE.	WHEAT.		BARLEY.		OATS.		PEAS.		BEANS.	
	Week.	Agg.	Week.	Agg.	Week.	Agg.	Week.	Agg.	Week.	Agg.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Jan. 15.	26 5	56 5	29 6	29 7	21 8	21 6	35 11	36 3	31 9	32 10
22.	56 2	56 3	29 4	29 6	21 1	21 5	35 2	35 11	31 3	32 3
29.	56 6	56 1	29 4	29 5	20 9	21 3	34 7	35 5	31 4	31 10
Feb. 5.	56 6	56 1	29 2	29 5	21 0	21 3	35 1	35 2	31 1	31 7
12.	57 2	56 5	29 2	29 4	20 7	21 1	35 0	35 3	30 5	31 4
19.	58 4	56 9	29 3	29 3	21 4	21 0	35 0	35 3	31 2	31 2
26.	59 1	57 3	28 11	29 2	21 1	20 11	35 7	35 2	30 9	31 0
March 5.	59 11	57 11	28 7	29 0	21 7	21 0	35 5	35 3	30 9	30 11
12.	60 8	56 7	28 6	29 0	21 7	21 2	35 4	35 4	30 11	30 10
19.	61 2	59 4	29 5	29 0	21 11	21 4	35 10	35 6	31 4	30 10
26.	62 9	60 3	29 10	29 2	22 4	21 7	35 9	35 5	31 11	31 1
April 2.	65 1	61 5	31 1	29 5	22 11	21 4	35 2	35 6	35 5	31 6

The butcher-markets have generally tended to decline, and there has been much difficulty in effecting sales. A great loss accordingly has been sustained on feeding stock. Latterly there have been symptoms of increasing demand, though with little, if any, effect upon the price.

Wool, after a long depression, has become more in demand, and realized a certain increase of price. Notwithstanding considerable importations, the stock in the country is understood to be diminishing. The low price of the raw material has doubtless tended to sustain and extend the woollen trade. These circumstances, it is to be presumed, will effect a certain increase of price, though we do not anticipate that this will be considerable.

Although there is thus a tendency to advance in articles of farm produce, this has been too late in arriving, and too inconsiderable in extent, to allow us to speak of the present times otherwise than as the most disastrous that have been encountered by the agriculturists of the country. It is grievous to think how great a waste of farming capital has taken place, and how long a period even of favourable circumstances will be required to replace it to the sufferers. Again we press upon the attention of landed gentlemen, the humanity, the wisdom, and the necessity even of a lenient exaction upon the funds of the tenants.

TABLES of the Average Prices of the different kinds of GRAIN, per Imperial Quarter, and of BUTCHER MEAT, sold at the following Markets, from 1st January to 31st March 1890.

LONDON.							HADDINGTON.						
Date.	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.	Date.	Wheat.	Barley.	Oats.	Peas.	Beans.	
Jan. 4.	s. d. 60 6	s. d. 39 7	s. d. 23 6	s. d. 32 0	s. d. 36 6	s. d. 37 2	Jan. 1.	s. d. 52 4	s. d. 28 6	s. d. 21 9	s. d. 26 9	s. d. 28 4	
11.	61 0	39 2	23 4	30 0	35 6	34 6	8.	51 2	29 3	21 10	27 9	28 9	
18.	59 7	39 6	23 3	31 0	32 0	35 0	15.	52 10	27 10	22 2	28 0	28 10	
25.	59 10	31 0	23 4	30 9	34 0	32 6	22.	53 4	28 10	21 8	26 10	28 4	
Feb. 1.	60 6	31 6	23 3	32 0	34 2	33 2	29.	52 5	28 10	21 8	27 3	28 10	
8.	60 2	31 4	22 7	32 4	34 0	31 6	Feb. 5.	53 8	28 8	22 5	27 2	28 11	
15.	60 2	29 4	22 6	33 0	36 0	32 0	12.	51 7	28 11	23 4	27 0	30 6	
22.	61 0	30 4	22 9	33 6	34 0	31 0	19.	56	29 2	24 5	29 2	31 9	
Mar. 1.	63 0	29 6	22 6	34 0	35 0	30 0	26.	56 10	29 1	24 4	28 0	32 8	
8.	65 11	30 1	22 2	33 6	35 6	30 6	Mar. 5.	56 5	30 8	24 7	29 11	32 0	
15.	66 7	30 2	22 10	34 6	36 0	30 6	12.	57 5	29 11	23 10	31 0	33 2	
22.	64 11	30 10	22 10	34 0	35 6	31 6	19.	58 4	30 7	25 1	32 2	32 3	
29.	66 10	31 5	23 2	36 4	35 4	31 6	26.	61 1	31 7	25 0	32 1	32 6	
LIVERPOOL.							EDINBURGH.						
Date.	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.	Date.	Wheat.	Barley.	Oats.	Peas.	Beans.	
Jan. 5.	s. d. 56 7	s. d. 31 6	s. d. 22 0	s. d. 31 0	s. d. 35 4	s. d. 36 6	Jan. 6.	s. d. 54 5	s. d. 31 4	s. d. 23 1	s. d. 27 1	s. d. 28 6	
12.	55 8	29 6	22 0	30 6	35 0	35 6	13.	55 9	31 6	24 9	28 0	29 0	
19.	56 0	31 0	21 0	30 4	35 0	32 0	20.	57 2	31 9	24 2	28 2	29 1	
26.	56 6	32 0	21 6	30 0	33 0	31 0	27.	54 11	30 0	23 9	29 6	30 8	
Feb. 2.	55 6	32 3	20 6	30 6	33 0	31 6	Feb. 3.	56 8	30 0	23 4	28 9	30 2	
9.	56 0	31 10	20 9	30 0	32 6	32 0	10.	56 11	31 0	23 9	29 0	30 6	
16.	50 8	34 1	20 6	31 0	34 0	33 6	17.	59 5	30 9	24 2	29 6	31 6	
23.	58 2	35 6	20 10	31 2	33 0	30 2	24.	60 8	32 9	24 10	30 4	32 6	
Mar. 2.	59 6	29 6	20 6	31 0	33 6	30 2	Mar. 3.	60 5	31 2	25 2	32 4	33 6	
9.	59 9	28 10	21 7	32 0	34 4	30 0	10.	60 5	29 10	24 10	31 10	32 9	
16.	60 3	31 6	21 6	32 6	33 6	29 10	17.	60 11	31 4	25 6	33 2	33 9	
23.	62 8	32 3	22 4	32 0	33 0	30 0	24.	62 2	31 8	26 7	32 9	33 8	
30.	63 6	32 0	23 9	33 0	34 6	31 6	31.	65 7	31 9	25 4	32 6	33 6	

AVERAGE PRICES OF GRAIN AS SOLD IN THE MARITIME DISTRICTS.

	Wheat.		Barley.		Oats.		Rye.		Peas.		Beans.	
Date.	Quarters.	Price.	Quarters.	Price.	Quarters.	Price.	Quarters.	Price.	Quarters.	Price.	Quarters.	Price.
Jan. 1.	67,678	55/5	81,097	29 8	45,550	21/8	346	30/7	2,681	35/8	5,073	32/2
8.	60,777	56/1	82,520	29 6	43,332	21/5	280	32/6	1,790	34/11	3,983	32/3
15.	70,545	56/3	78,304	29 6	51,354	21/8	201	31/11	2,410	35/11	6,086	31/9
22.	65,329	56/2	80,725	29/4	50,985	21/1	530	36/9	2,408	35/2	6,147	31/5
29.	69,894	56/5	74,199	29/2	45,486	21/	537	35/5	2,414	35/1	7,072	31/1
Feb. 5.	73,443	57/2	60,126	29/2	41,964	20/7	600	33/2	2,457	36/	7,556	30/6
12.	76,146	57/6	61,750	29/3	50,540	21/	526	33/6	2,560	35/6	8,120	30/9
19.	70,299	58/4	62,065	29/3	57,877	21/4	411	34/11	2,941	35/	8,750	31/2
26.	75,397	59/1	70,598	28/11	63,234	21/1	639	34/7	2,925	35/7	9,522	30/9
Mar. 5.	77,743	59/11	68,555	28/7	60,082	21/7	424	34/	2,619	35/5	10,912	30/9
12.	67,119	60/1	60,311	29/	60,417	21/7	1,029	37/3	2,490	35/4	11,099	30/11
19.	70,004	61/2	61,631	29/5	53,575	21/11	425	34/4	2,421	35/10	11,390	31/4
26.	78,705	62/9	47,409	29/10	59,794	22/4	1,210	36/4	1,393	35/9	9,918	31/11

PRICES OF BUTCHER MEAT.

	SMITHFIELD, Per Stone of 14 lb.		MORPETH, Per Stone of 14 lb.		EDINBURGH, Per Stone of 14 lb.		GLASGOW, Per Stone of 14 lb.	
Date.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
Jan.	4/9 @ 7/	5/6 @ 7/9	4/9 @ 6/	4/6 @ 5/6	5/ @ 7/	5/ @ 6/6	5/3 @ 7/	5/6 @ 6/6
Feb.	5/ @ 7/	5/6 @ 8/	4/9 @ 5/9	4/6 @ 6/	4/9 @ 6/6	4/9 @ 6/6	5/6 @ 7/6	5/9 @ 7/
Mar.	5/3 @ 7/	5/6 @ 7/3	4/6 @ 5/9	5/ @ 6/3	4/6 @ 6/	4/9 @ 6/	5/ @ 6/6	5/0 @ 6/3

PRICES OF SEEDS AT THE PORTS OF LONDON AND LIVERPOOL.

Date.	AVERAGE PER CWT. OF 112 LB.						AVERAGE PER IMPERIAL QUARTER.			AVERAGE PER IMPER. BUSH.			
	Clover Seed, Foreign.			Clover Seed, English.			Ryegrass.		Linseed.	Turnipseed.			
	Red.	White.		Red.	White.		Common.	Pacey's	Sowing.	Swedish.	Yellow.	White.	
Jan. 48	@ 84/55	@ 84/42	@ 84/50	@ 86/50	@ 86/30	@ 38	36 @ 45	36 @ 40	71 @ 14 11/8	@ 13/6	7/6 @ 10		
Feb. 48	86/56	83/42	86/52	87/21	32/5		36 45/6	37 41 12	12 11/8	14 8	10		
Mar. 48	130/56	86/52	96/52	87/22	30		37 47	38 42	12/6	15 12	15 2/6	14/6	

AVERAGES which regulate the Duties on FOREIGN CORN.

	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.
Per Imp. Quart.	62/3	22/5	21/10	35/1	68/6	31/6

DUTIES payable on FOREIGN CORN.

	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.
Per Imp. Quart.	22/8	12/4	12/3	14/9	16/9	22/9

PRICES of English and Scotch WOOL.

ENGLISH, per 16 lb.—*Merino*, Washed, 12/6 @ 17/6; in Grease, 7/ @ 11/6.—*South Down*, 7/6 @ 11/6; *Leicester Hog*, 10/ @ 11/; *Ewe and Hog*, 8/6 @ 10/6.—*Moor*, *Ewe and Hog*, 3/6 @ 5/6.

SCOTCH, per 16 lb.—*Leicester*, *Hog*, 9/6 @ 10/6; *Hog*, 8/6 @ 10/6; *Ewe and Hog*, 8/6 @ 9/6.—*Chetiv*, *Hog*, 7/6 @ 9/; *Ewe*, 6/ @ 8/.—*Moor*, *Ewe and Hog*, 2/9 @ 5/6.—*Chetiv*, 12d. per 24 lb 7/ @ 9/.—*Moor*, 3/6 @ 5/.

FIAR PRICES of the different COUNTIES of SCOTLAND, for Crop and Year 1829, both by the Imperial and Local Measure, the Old Measure varying in different Counties.

ABERDEENSHIRE.

	Imp. Qt.	Boil.
Wheat, without fodder, . . .	58/	32/
— with fodder, . . .	58/	35/10
Barley, without fodder, . . .	33/1	21/
— with fodder, . . .	31/	25/
Bear, without fodder, . . .	24/10	20/
— with fodder, . . .	23/10	24/
Oats, Potato, without fod. . .	19/10	16/
— with fodder, . . .	25/10	20/10
— Common, without fod. . .	18/8	14/10
— with fodder, . . .	24/6	15/6
Peas and Beans, . . .	22/	12/
Malt, . . .	52/	42/
Oatmeal, per 140 lb. . .	12/	

BANFFSHIRE.

	Imp. Qt.	Boil.
Wheat, . . .	51/	27/8
Barley, without fodder, . . .	25/	19/7 1/2
— with fodder, . . .	26/6	23/4
Bear, without fodder, . . .	24/	18/10
— with fodder, . . .	23/6	22/4 1/2
Oats, Potato, without fodder, . . .	19/	15/
— with fodder, . . .	24/	18/10
— Common, without fod. . .	16/9	13/3
— with fodder, . . .	21/9	17/1
Peas and Beans, . . .	32/	17/3
Oatmeal, per 140 lb. . .	14/	16/11

BERWICKSHIRE.

	Imp. Qt.	Boil.	
Wheat, . . .	49/4	35/10 1/2	6 Win. Bush.
Barley, <i>Merse</i> , . . .	26/6	20/2 1/2	4 Fir.
— <i>Lammermuir</i> , . . .	27/2	19/2 1/2	
Oats, <i>Merse</i> , . . .	23/	14/	
— <i>Lammermuir</i> , . . .	21/8	15/2 1/2	
Peas and Beans, . . .	33/ 1/2	24/6	6 Win. Bush.
Oatmeal, . . .		16/2 1/2	

AYRSHIRE.

	Imp. Qt.	Old Boil.	
Wheat, . . .	50/6 1/2	24/6	4 Win. Bush.
Barley, . . .	31/3 1/2	20/4	8 Win. Bush.
Bear, . . .	25/2 1/2	25/	
Oats, . . .	16/7	18/1	
Peas & Beans, . . .	32/2	16/8	4 Win. Bush.
Oatmeal, 140 lb. . .	14/2	52/	

BUTESHIRE.

	Imp. Qr.	Boll.
Wheat,	52/4	25/8
Barley,	32/8	22/
Beer,	24/6½	24/
Oats,	23/3	22/
Oatmeal, 140 lb.	15/8	18/9

CLACKMANAN.

	Imp. Qr.	Boll.
Wheat,	55/8	25/3½
Barley, Kerso,	30/3	23/6
— Dryfield,	30/9	23/6
— Muirland,	28/	21/8
Oats, Kerso,	22/8	17/6
— Dryfield,	22/8	17/6
Peas and Beans,	31/4	17/
Malt,	52/	40/3
Oatmeal,		17/

DUMBARTON.

	Imp. Qr.	Boll.
Wheat,	55/1	27/8
Barley,	30/8½	24/6
Beer,	28/1½	22/5
Oats,	22/7	18/
Peas and Beans,	30/2½	18/1
Oatmeal, 140 lb.	17/11	

DUMFRIES.

	Imp. Qr.	Boll.
Wheat,	54/1½	27/8
Barley,	27/5½	20/3
Beer,	24/28	18/
Oats, Potato,	21/1½	15/4½
— Common,	19/0½	13/10½
Peas,	30/9	15/4½
Beans,	32/0½	16/
Rye,	35/	18/
Malt,	72/	36/
Oatmeal,		16/5

EDINBURGHSHIRE.

	Imp. Qr.	Boll.
Wheat, Best,	52/8	26/3½
— Second,	48/8	24/2½
Barley, Best,	30/4	22/1
— Second,	28/	20/4½
— Third,	24/	17/5½
Oats, Best,	21/8	15/9½
— Second,	19/4	14/1
Peas and Beans,	22/8	14/9½
Oatmeal, per 112 lb.	13/7	17/

FIFESHIRE.

	Imp. Qr.	Boll.
Wheat, White,	49/9	25/0½
— Red,	47/8	24/0½
Barley,	29/9	21/7
Beer,	27/11	20/5½
Oats,	26/3	16/3
Peas and Beans,	27/6	13/10
Rye,	27/9	13/11½
Malt,	55/	36/10½
Oatmeal, 260 lb.	33/10	36/11

FORFAR.

	Imp. Qr.	Boll.
Wheat,	50/3	26/
Barley,	28/9	21/6
Béar,	25/1	19/
Oats, Potato,	23/1	17/3
— Common,	21/5	16/2
Peas and Beans,	26/9	13/10
Oatmeal, per 140 lb.	16/3	

HADDINGTON.

	Imp. Qr.	Boll.
Wheat, Best,	54/10½	29/5
— Second,	54/11½	27/5
— Third,	50/7½	26/3
Barley, Best,	37/1	27/
— Second,	33/4½	24/4
— Third,	30/7	22/3
Oats, Best,	24/10	18/1
— Second,	22/11½	16/9
— Third,	21/7½	15/9
Peas and Beans, Best,	30/1½	14/
— Second,	28/1½	14/5½
— Third,	25/5	14/2

INVERNESS.

	Imp. Qr.	Boll.
Wheat, without fodder,	48/10	22/ 3 Fir.
— with fodder,	54/1	31/
Barley, without fodder,	30/1	23/ 4 Fir.
— with fodder,	33/4½	25/5
Beer, without fodder,	26/3	20/
— with fodder,	29/5½	22/6
Peas and Beans, without fod. 31/4½		18/ 3 Fir.
— with fodder,	28/3	22/6
Rye, without fodder,	26/3½	18/6
— with fodder,	30/4½	22/
Oats, Common, without fod. 19/4½		16/5 5 Fir.
— with fodder,	22/6	21/6
— Black, without fodder, 10/11½		10/6
— with fodder,	14/7½	14/
Oatmeal,		17/ 9 St. D.

KINCARDINE.

	Imp. Qr.	Boll.
Wheat, without fodder,	51/	26/4
— with fodder,	56/	32/
Barley, without fodder,	27/4	20/6½
— with fodder,	32/4	24/3½
Beer, without fodder,	23/8	17/9½
— with fodder,	28/8	21/6½
Oats, Potato, without fodder 20/1		15/2½
— with fodder,	25/1	19/7½
— Common, without fod. 19/4		14/8
— with fodder,	25/4	20/
Peas, without fodder,	26/5	13/10
— with fodder,	35/5	18/3
Beans, without fodder,	27/9	14/3
— with fodder,	34/9	18/11½
Oatmeal, 140 lb.		14/5

KIRKCUDBRIGHT.

	Imp. Qr.	Boll.
Wheat,	54/3	29/11½ 12 Wm. Bush.
Barley,	28/	41/3
Beer,	26/	38/
Oats, Potato,	19/2½	22/
— Common,	17/6	25/6
Oatmeal, 140 lb.	16/0½	40/ 16 Stone Dutch.

LANARKSHIRE.

	Imp. Qr.	Boll.
Wheat, Best,	55/12	27/8
— Second,	52/10	26/4½
Barley, Best,	30/	21/10½
— Second,	28/8	20/10½
Beer, Best,	25/8	18/8
Oats, Best,	21/9½	15/10
— Second,	20/3	14/9
Peas and Beans, Best,	35/6½	18/3
— Second,	34/0½	17/
Malt,	52/	26/
Oatmeal, Best,	34/	17/
— Second,	32/7	16/3½

ARCHBISHOPRIC OF GLASGOW.

	Imp. Qr.	Boll.
Barley,	22/	23/4
Oats,	21/11½	16/
Meal, per cwt.,	13/9	17/1

LINLITHGOW.

	Imp. Qr.	Boll.
Wheat,	48/9	24/10
Barley,	31/	23/6
Oats,	21/5	15/8
Peas,	31/11	15/11
Malt,	51/7	37/7
Oatmeal, cwt. 112 lb.	12/11½	16/2

MORAY AND ELGIN.

	Imp. Qr.	Boll.	
Wheat,	48/8½	25/11	
Barley,	28/8½	22/	4 Fir.
Oats,	21/	15/4	5 Fir.
Rye,	38/1	16/10	
Oatmeal, cwt.	15/7½	19/6	8 St.

NAIRN.

	Imp. Qr.	Boll.	
Wheat,	50/4½	26/6	
Barley, without fodder,	29/4½	22/6	
— with fodder,	32/4½	25/6	
Oats, without fodder,	19/3½	19/	5 Fir.
— with fodder,	24/2½	24/	
Peas and Beans,	34/2½	18/6	
Rye,	34/2½	18/6	
Oatmeal, cwt.	13/1½	14/6	

PEEBLES.

	Imp. Qr.	Boll.
Wheat, Best,	48/	23/11½
— Second,	45/7	22/9
— Third,	41/0½	20/6
Barley, First,	30/	21/11
— Second,	28/	20/5
— Third,	25/8	18/8
Bear, First,	24/	17/6
— Second,	23/8	17/3
— Third,	22/8	16/6
Oats, First,	19/7	14/5
— Second,	17/6	12/9
— Third,	15/7½	11/5
Peas and Beans, First,	30/	14/11½
— Second,	28/6	14/9
— Third,	24/4	14/2
Oatmeal, First, 280 lbs.	33/5	16/7
— Second,	32/6½	16/2
— Third,	31/8½	15/9

PERTH.

	Imp. Qr.	Boll.
Wheat, Best,	58/7	29/3
— Second,	51/7	25/9
Barley, Best,	28/6	20/9
— Second,	25/	19/8
Oats, Best,	23/8	16/4
— Second,	21/	15/
Peas and Beans,	28/6	13/3
Rye,	22/8	11/6
Oatmeal, 140 lbs.	15/9	

RENFREW.

	Imp. Qr.	Boll.
Wheat, Best,	55/	29/5
— Second,	53/10½	26/11
Barley, Best,	35/2	23/3½
— Second,	34/6	27/3½
Bear,	32/3	24/9
Oats, Best,	23/1½	12/2
— Second,	20/6½	16/3
Beans,	37/1½	18/6½
Peas,	34/	19/9
Oatmeal, Best,		17/
— Second,		16/11½

ROXBURGH.

	Imp. Qr.	TeV. Boll.
Wheat,	50/1	32/6
Barley,	29/4	26/10
Oats,	25/	20/10
Peas,	32/6½	21/2
Beans,	33/6	21/9
Oatmeal,		

ROSS AND CROMARTY.

	Imp. Qr.	Boll.
Wheat,	52/	25/10
Barley,	29/6	21/11½
Bear,	28/6	19/
Oats, Potato,	28/10	17/
— Common,	19/	14/4
Oatmeal,		18/8½ 9 St.

SELKIRK.

	Imp. Qr.	Boll.
Wheat,	50/5	30/6
Barley,	26/11	25/ 5 Fir.
Oats, Potato,	20/3	18/10
— Common,	19/4½	18/
Peas and Beans,	31/	19/10
Oatmeal, per 200 lb.	33/3	

STIRLING.

	Imp. Qr.	Boll.
Wheat,	52/	25/9
Barley, Kersae,	31/1½	25/4½
— Dryfield,	28/5½	21/4½
Oats, Kersae,	22/8	17/
— Dryfield,	20/	15/
— Muirland,	17/4	13/0½
Peas and Beans,	33/	18/10
Malt,	52/	46/
Oatmeal,	16/6	

SUTHERLAND.

	Imp. Qr.	Boll.
Wheat,	50/	24/11½
Barley,	30/	22/6
Bear,	27/6	20/8
Oats, Potato,	23/6	16/8
— Common,	21/	15/2
Oatmeal, 140 lb.	17/6	23/3

WIGTON.

	Imp. Qr.	Gal. Boll.
Wheat,	48/	46/6 8 Win. Bush.
Barley,	29/4	42/6 12 Win. Bush.
Bear,	24/8	26/6
Oats, Potato,	18/	26/3
— Common,	16/8	24/1
Peas and Beans,	29/4	28/6 8 Win. Bush.
Rye,	28/8	41/6 12 Win. Bush.
Oatmeal, per 280 lb.	30/8	38/4 16 st. Dutch.

* * * In a former Number we stated, for the information of our English readers, that the Fiar Prices are the average prices of grain, as ascertained every year by the verdicts of Juries in every county in Scotland. These Juries are summoned in spring, and ascertain, from the evidence produced to them, the average prices of the preceding crop. By these prices, rents payable in grain, and similar contracts, are generally determined; but the main object is to convert into money the stipends (for the most part fixed at a certain quantity of grain) of the Scottish clergy.

FOREIGN CORN MARKETS.

THE prospect of the averages in this country advancing, and the duties on wheat declining in proportion, occasioned during the months of January and February considerable animation in the Continental markets, and purchases to a large extent have been made for shipment to Britain in spring, the arrival of a great proportion of which may be looked for very shortly. We give the following particulars of what has been passing from the advices we have received from time to time during the last three months.

HAMBURG.—Considerable supplies of wheat have been received here chiefly from Mecklenburgh, the quality of which proves much superior to that of Holstein this season, both as regards weight, colour, and condition. The average weight of Mecklenburgh wheat does not exceed from 59/ @ 60/ Ψ bushel imperial, and this ought to be no matter of surprise when the unfavourable weather which was experienced here during last summer is taken into consideration.

What good wheats have come to hand, have been taken at prices from 30/ @ 35/ per quarter free on board, in which calculation both Fire Insurance and all granary rent up to that time are included, only excepting Commission of 2½ per cent. The best samples of Holstein wheats have been selected at lower prices, say from 27/ @ 28/ per quarter free on board, but the quality is inferior, and the weight lighter by 1 lb. per bushel.

There has been very little done in barley, and good Holstein weighing 50 lb. has been purchased at the low price of 12/ @ 13/ free on board. The quality is much similar to that of last year; now and then a few sprouted grains appear, but with a careful selection, and the refusal of all secondary samples, some good shipments may be made. The supplies of all other grain are inconsiderable, and prices may be quoted as follows, viz.

Best white Boiling Pease,	. . .	17/ @ 18/ Ψ quarter.
Feed Oats,	. . .	10/ @ 10/6
Rapeseed,	£23 Ψ last of 10 quarters.	
Rape Cakes,	£3, 12/ @ £3, 15/ Ψ ton.	
Linseed Cakes,	£5, @ £5, 10/ Ψ do.	

The stocks of rapeseed are by no means large, and from the very unfavourable prospects for next crop, the growers are induced to be firm holders. The wet weather has not only prevented the sowing of seed, but what has already grown looks sickly and backward. This also applies to the crops of winter corn.

COPENHAGEN.—There has been a considerable business done here this season, especially in wheat and barley, and needy sellers only have appeared at market, holders having generally shown a disposition to hold, in the hope of realizing better prices. Good old wheat, about 58 lb Ψ bushel, has been

sold at prices rating from 31/ to 34/,—and inferior kinds of new, from 27/ to 28/. Barley has been taken at from 11/6 to 12/6, as in quality, weighing 50 lb to 51 lb $\frac{1}{2}$ bushel Imperial. Some parcels of Oats have been bought at 8/ to 8/6. Peas of good quality are scarce, and maintain high prices, say 21/ to 22/, while ordinary kinds may be had at 16/ to 18/. Tares generally come forward in bad condition; Old, of fair quality, worth 19/; New, 13/ to 14/.

ROSTOCK.—There has been considerable demand here throughout the season for wheat, for Holland, France, and England. Rather large supplies have been received, and the better kinds have gradually advanced in price. Some good samples have been taken for Britain, at 31/ to 32/, the weight reaching 60 lb $\frac{1}{2}$ bushel. Ordinary Wheats, weighing 57 lb, were purchased so low as 24/ $\frac{1}{2}$ quarter.—Barley and Oats have also been bought at cheap rates; good Malting, 51 to 52 lb, at 11/6 to 12/; and Oats, about 35 lb, at 7/6 $\frac{1}{2}$ quarter.—Rye at 16/; and White Boiling Peas at 15/ to 17/.—Freights are expected to rate so low as 4/ $\frac{1}{2}$ quarter, with 5/ $\frac{1}{2}$ cent. for wheat.

DANTZIG.—Comparatively so little good wheat was expected from the interior, that few contracts were made during winter, for spring delivery, this season; but late advices from England had occasioned some sensation; and last month about 400 lasts of fair high mixed were taken for English account, at from 40/ @ 44/ free on board, and tolerable mixed at 35/ @ 37/. The demand had not abated, but from the scarcity of really good sound wheats on the spot, no purchases of any moment could be effected, especially as the holders of the little of good quality that remains, insist on prices that no one will give. All eyes were directed with great anxiety to the fresh arrivals from the Victual Towns, which were kept back by the high-water on the river.

Quotations may be noted as follows:—

Wheat, high mixed,	40/ to 46/	Barley, . . .	12/ to 12/6
Mixed, . . .	35/	Oats, . . .	9/ to 9/6
Rex mixed, .	30/ to 32/	Peas, . . .	17/ to 20/
Rye,	15/ to 16/		
	$\frac{1}{2}$ Quarter, free on board.		

THE
QUARTERLY
JOURNAL OF AGRICULTURE.

ON THE RATE OF HUMAN MORTALITY AND LIFE INTERESTS.

1. DR PRICE's *Observations on Reversionary Payments, &c.* Sixth Edition. With Mr MORGAN's Notes. London, 1803.
2. *The Doctrine of Life Annuities and Assurances.* By Mr FRANCIS BAILY, of the Stock Exchange. London, 1810.
3. *A Treatise on the Valuation of Annuities and Assurances.* By Mr JOSHUA MILNE, Actuary to the Sun Life Assurance Society. London, 1815.
4. *Report made to the Lords of the Treasury, on the Evidence and Elementary Facts on which the Tables of the Government Life Annuities are founded.* By Mr JOHN FINLAISON, Actuary of the National Debt. London, March 1829.

MONEY transactions, depending upon the uncertainty of human life, have now been so extended, and become so important throughout Britain, as to affect more or less the interest of every class in the community. We hope, therefore, that it will be an acceptable service to our readers, in a matter not merely of useful information, but of much practical utility, to give some account of the evidence and facts upon which such transactions have hitherto been judged of, and of the progress made in the science of life contingencies generally, since it first began to be cultivated.

The doctrine of Compound Interest and Annuities for fixed periods, which forms an elementary part of this science, is of itself too simple and certain ever to have occupied much of the attention of mathematicians. But inquiries, involving probabi-

lities and the uncertainty of human existence, are greatly more complicated and interesting, and the facts and principles on which they depend have received more attention, though certainly not so much as the importance of such inquiries in this country would seem to demand. Questions regarding lives can be solved only by reference to some previously observed rate of mortality; but it is well known that the observations hitherto published present very different results, and that, in cases of the most ordinary occurrence, different opinions have been entertained as to which of them the preference ought to be given. It was chiefly to obviate this uncertainty that the report by Mr Finlaison referred to in our title was made to Government in the course of last session. The observations of most repute, which have hitherto appeared, have been analyzed in that report, and compared with new observations on the rate of mortality ascertained to have taken place among the Government Annuitants and Nominees of the national tontines since the earliest period. The very great number of lives upon which these new observations have been made, and the accurate information possessed in regard to sex and ages, must appear perfectly sufficient to fix the law of mortality prevailing among the sexes throughout the British empire, upon an incontrovertible basis; and no pains or labour have been spared in the report to have that object accomplished with every possible accuracy. The principal value, however, of these observations is, that they are the result of actual experience, without the theoretical rectifications for the fluctuations incident to cities; and in that view they must prove highly interesting to every one pursuing such inquiries. We have accordingly endeavoured, in the following pages, to present a full view of the results exhibited by the report; and, though we have found it necessary to consult a variety of authorities, we have had the other works referred to in our title chiefly before us in the short account which we have given of the earlier publications on the science.

Fermat, Pascal, and Huygens, by laying the foundation of the doctrine of probabilities about the middle of the seventeenth century, first opened the way to the solution of problems in Life Annuities. The earliest mathematical publication on probabilities was the little tract of Huygens, *De ratiociniis in ludo*

alce, which appeared in 1658. This was followed in 1671 by a *Treatise on Life Annuities*, published in *Dutch*, by his celebrated countryman John de Witt, which, however, appears to have been little known or read; and the true origin of the science may be properly dated from the publication of Dr Halley's paper in the *Philosophical Transactions* of the year 1693. That celebrated mathematician there first gave a Table of Mortality, constructed from observations made at Breslaw, and showed how the probabilities of living, with the values of life annuities and assurances, which it appears till then had been merely guessed at, might be determined by means of the table.

In the year 1724, M. De Moivre published the first edition of his tract on Life Annuities, in which, with the view of facilitating calculations, he assumed the annual decrements of life to be equal. This assumption gives a great facility in determining the values of annuities on single or joint lives at any rate of interest. And when it was applied to the supposition, "that out of 86 persons born alive, *one* of them will die annually till they are all extinct," the results obtained, were found to coincide very nearly with the values between 30 and 70 years of age derived from Dr Halley's table. The method of De Moivre, therefore, was of great use, at a time when the only table that existed was that of Dr Halley, calculated for every *fifth* year only of human life, and at *one* rate of interest.

No further information upon the rate of mortality was communicated to the public till the year 1742, when Mr Kerssboom of the Hague published tables constructed from registers of Life Annuitants kept in Holland and West Friesland. But the number of lives, whose current year of age at the time of their nomination was precisely given in these tables, did not much exceed 5000; and it is stated further, as the result of a recent investigation, "That the Table on which he assigns the law of mortality in his time and country, does not, by any means, result from so much of his data as he has published."

In the same year 1742, Mr Thomas Simpson published his "*Doctrine of Annuities and Reversions*," in which the subject is treated in a manner much more general and perspicuous than it had been previously. His rules apply to any table of observations, and he first gave the obvious method of determining,

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from the value of an annuity on any single life, or joint lives, the value of an annuity on a life, or joint lives, one year younger ; by which the trouble of calculating Annuity Tables is very greatly abridged.

In this treatise Mr Simpson also gave a Table of Mortality, derived from observations made by Mr Smart at London, with other tables showing the values of annuities calculated from it, at three rates of interest, both upon single and joint lives. These were the first tables showing the values of annuities upon joint lives which had appeared ; but the mortality shown by the London table was so much greater than the common average of the kingdom, that the values of the annuities were soon ascertained to be considerably too small for general use.

A few years after this period, M. De Parcieux published his "*Essai sur les Probabilités de la Durée de la Vie Humaine*," in which he gave several Tables of Mortality, deduced from the mortuary registers of different religious houses, and from the lists of the nominees in the French tontines. He also published a table, calculated from these tontine lists, showing the values of annuities on single lives at three rates of interest.

It appears, however, that he had not the advantage of personal access to the original records of the two tontines on which his observations are made, but compiled his facts from an incomplete file of the flying sheets, which, for the information of shareholders, are, in all tontines, periodically distributed to announce the death of nominees. It may be probably owing to the imperfect evidence on which he proceeded, that the rate of mortality in one of the tontines, reckoning from the age of 40 and upwards, is found to be unaccountably less than in the other. Such as they were, however, his tables proved to be a considerable acquisition to the science at the time when they appeared. The greater longevity of females, which had been noticed previously, was placed in a clear light by his tables for the monks and nuns ; and it seems not very easy to explain why it has come to be so much overlooked in the different schemes and societies which have been instituted since.

The observations of M. De Parcieux were followed by several others, among which may be chiefly noticed, those of M. Duprè de Saint Maur, M. Sussmilch, and M. Wargentin. In the year 1760 also, there is a paper by the celebrated Euler in the

Transactions of the Royal Academy at Berlin, entitled, "*Recherches générales sur la Mortalité, et la Multiplication du Genre Humain*," in which the subject is treated algebraically. A few years afterwards, similar mathematical inquiries were pursued to a still greater extent by J. H. Lambert, who appears first to have demonstrated clearly the principal properties of Tables of Mortality. But, upon the whole, little further practical or essential improvement was made on the science till the publication of Dr Price's "Observations on Reversionary Payments." The chief object of this work was to expose the delusions practised by a class of men, who, under pretence of establishing societies for the *benefit* of old age and widows, were forming schemes for their own advantage, calculated to defeat the hopes of the unwary and distressed. To exhibit, however, in a more forcible light, the futility and extravagance of these schemes, Dr Price felt the necessity of having more accurate observations on lives than any which had at that time been made; and, accordingly, with the assistance of some public spirited individuals, he obtained registers of the mortality at Northampton, Norwich, Chester, and some other places in England. The fourth edition of his work, published in 1783, was enriched with several valuable tables of annuities both on single and joint lives, at different rates of interest, derived from the probabilities of life as observed at Northampton, and in the Kingdom of Sweden. His writings effected, in a great degree, the primary object which he had in view; and the tables given by him almost entirely superseded the use of any others then extant.

In 1783, likewise, Mr Baron Maseres published a Treatise on Life Annuities, to which Tables were annexed, showing the values of annuities on a single life, and on two joint lives, according to the observations of M. De Parcieux. These, and the tables of Dr Price, gave a stability to transactions depending on lives, of which they had not previously been thought susceptible, and promoted, in a great degree, their present extension throughout the kingdom. The experience had since, however, and the more accurate observations which have been made, leave no doubt, that, except in extreme old age, the *values of annuities*, according to the Northampton observations, are *too low* for the general average of this country; and, in the same degree, the *premiums required for assurances* are *too high*. Of this, a more

satisfactory proof could not be given, than that many offices, which were originally established for the purpose, as well of granting annuities as taking assurances on lives upon the footing of these observations, have since considered it advisable to discontinue the annuity part of their business, and to restrict themselves entirely to assurances. The values of annuities derived from the observations of M. De Parcieux, are considered to be nearer the truth at ages under 60, though, at older ages, they are certainly too low.

The mathematical part of the science has more recently been greatly improved and extended, in Mr Morgan's papers, published in the Philosophical Transactions between 1778 and 1800; and as regards analytical investigation, the subject, in all its branches, has since been carried to the highest perfection, in the *Treatise on Life Annuities and Assurances* published by Mr Francis Baily in 1810. That gentleman's object has been to present all that is useful and important in the works of preceding writers, with such additional information as a more improved analysis and more recent discoveries in science have been able to afford. His book also, besides a collection of the whole tables of observations and annuities which had previously appeared in this country, contains new tables of the values of assurances on single and joint lives, derived from the observations of De Parcieux, and those made in Sweden.

These publications supplied the mathematical information necessary for the solution of any cases of annuities and assurances that could almost be conceived to occur in business; but this, it may be observed, is a part of the science which, in the modern improved state of analysis, was not likely to present any serious difficulty. It was not however sufficient, without accurate tables of mortality, to which the formulæ might be applied; and these still remained imperfect, chiefly from the want of observations sufficiently extensive and authentic.

To remedy in some degree this deficiency, Mr Joshua Milne, Actuary to the Sun Life Assurance Society, published his "*Treatise on the Valuation of Annuities and Assurances on Lives and Survivorships*" in the beginning of the year 1815. His work contains upwards of 50 new Tables, with a few others which had appeared before, but were reprinted on account of their value and scarcity. Four of the new ones are Tables of Mortality

constructed by him from registers kept at Carlisle and Montpellier, and in all Sweden and Finland, since the period of the observations referred to by Dr Price. The sexes also, it may be mentioned, are distinguished in the tables for Sweden and Montpellier, though not in that for Carlisle. In the mathematical part of the work, Mr Milne adopted a new and very expressive notation, which has been applied by him with good effect to the extension of some of the theories of preceding writers, and particularly in his formulæ for constructing tables of mortality.

Since the publication of Mr Milne's book, different papers upon the law of mortality have appeared in the London Philosophical Transactions; the first by Mr B. Gompertz "On the Nature of the Function expressive of the Law of Human Mortality, and on a new mode of determining the Value of Life Contingencies;" the other by Dr Young, being "A Formula for expressing the Decrement of Human Life." Mr Gompertz's researches are founded upon a remark, that the series expressing the number of persons living at ages, in arithmetical progression, according to the published tables, has, under certain limitations, a near agreement with a geometrical series. Dr Young's investigations, again, have been directed to ascertain a medium rate of mortality from former tables of observations.

It would be foreign to our present purpose to enter into a minute detail of these theories, though it may be useful to notice, shortly, some of the observations made by Dr Young upon former tables, and to explain the object which he has had in view in his investigations, and the manner in which it has been accomplished.

It may first, however, be necessary to remark, that a decided increase has been observed of late years in the mean duration of human life, throughout most parts of Europe. This has been ascribed, in part, to the effects of vaccination, and the general improvement in the practice of medicine, and in some degree also to the greater comforts of the poorer, and the more temperate habits of the richer, classes of society. It has, accordingly, been part of Dr Young's object to give due effect to this improvement; and he has likewise suggested a mode of appreciat-

ing the regularity and analogies of former observations, by constructing a diagram in the form of a curve, of which the absciss represents the Age, and the ordinates the corresponding decrements of Life. "The inspection of such a diagram," he has observed, "is sufficient to convince us of the great irregularity of the Carlisle Tables of Mortality, which must obviously have been formed, as they confessedly were, from observations on a very limited number of individuals, so that they exhibit a succession of different climacterica, after which the mortality is diminished; while, about the age of 74, the curve that represents them towers to an incredible height, affording an expectation of longevity which some of the strongest advocates of those tables have abandoned in their practical applications, since they take their estimate of life in advanced age even lower than it is represented in the Northampton Tables."

Another part of the Doctor's object, therefore, has been to obtain a curve of a more uniform flexure; and the following, he explains, is the manner in which this has been accomplished. "It appears, therefore, to be highly probable, that the fairest basis for general computation to be applied throughout Great Britain, may be obtained by a proper combination of the Tables of Northampton, which have been long known, and very generally approved, with the Carlisle Tables, corrected, however, in their extravagant values of old lives, by some other documents; and with the mortality of London, as derived from the parish registers, which, when thus incorporated with tables formed in the country, will be freed from the objections that have been made to the observations of burials in great cities only.

"The Carlisle Table agrees in the earlier parts pretty nearly with the observations of Mr Morgan, on the experience of the Equitable Office from 1768 to 1810, as it appears from Mr Milne's comparison, as well as from the reduction and interpolation of those observations published by Mr Gompertz in the Philosophical Transactions for 1825; but for correcting the later portions of the Carlisle Table, it may be allowable to employ a subsequent register of the experience of the Equitable Office, so far as it is possible to make any inferences from it with safety.

“Of the mortality of London, taken for the ten years from 1811 to 1820, it may be observed, that its results bear the internal evidence of greater apparent correctness than either of the other bases, exhibiting a curve less irregular in its flexures; and generally intermediate between the others; it has also the advantage of exhibiting the duration of life as prolonged by the general introduction of vaccination; and when thus incorporated with the registers of two places in the country, each reduced to an equal supposed population, it must probably be sufficiently corrected for the errors that may be attributed to the effect of an afflux of settlers at an early age. The mean obtained in this manner might be employed at once as a standard table without much inconvenience, but it still exhibits some minute but obvious irregularities, as an inspection of the line of stars in the diagram * will show, principally perhaps from the want of skill or care with which the interpolations have been made by Dr Price and others. The most effectual of all interpolations for *harmonising* the various orders of differences, is to obtain a formula which shall extend, with sufficient accuracy, throughout the whole curve. It may be easily believed, that it must be extremely difficult to find such an expression, and that its form must be too complicated to be applied to any practical purpose throughout its extent. I have, however, drawn a curve, which comes extremely near to the line of stars, and crosses it in ten or twelve different points by means of the equation $y = .\&c.$ ”

Our readers need not be alarmed, lest we are about to inflict this equation upon them. From the mode in which it has been obtained, it is obviously quite empirical, and indicates no observed rate of mortality; and, indeed, its principal use, as Dr Young has explained, is to shape out a curve, holding a smooth path through the intricacies of others derived from actual observation. It seems besides to be somewhat hasty to assume, that the accuracy of any set of observations is to be judged of merely from the smoothness of a curve drawn in the way that has been explained, and it is certain, that in business, no one would rest

* It has been thought unnecessary to give the diagram here referred to, but any of our readers who may be curious on the subject, will find it in the London Philosophical Transactions for the year 1826.

his interests upon such a test. Labours similar to those of Mr Gompertz and Dr Young may have some utility in certain cases of approximation, but, upon the whole, it may reasonably be doubted, whether researches of that kind are not more calculated to retard than to advance the progress of the sciences, since their obvious tendency is to lead the attention of mathematicians from what is, or might be, matter of accurate observation, to methods of mere speculation and conjecture.

We regret to observe how little the science has been cultivated in this northern part of the kingdom. The beneficent researches of Dr Webster, and the admirable tract given by Dr Hamilton in his Arithmetic, have been long held in high estimation. To these we are now also enabled to add, the Report on Friendly or Benefit Societies, drawn up by a Committee of the Highland Society, in 1824, and the full and clear Account of Friendly Societies, given by Mr W. Fraser, in the 5th and four subsequent numbers of the Edinburgh New Philosophical Journal. But, besides these, we are aware of no other publications on the science that have appeared in Scotland, with the exception of the "Principles of Life Annuities and Assurances practically illustrated," by an accountant, printed at Edinburgh last year, and to which the author has declined to put his name. The object of this little treatise, as has been explained in the introduction to it, is to furnish merely a practical introduction to the principles of annuities and assurances on lives, in a cheap and popular form, for the use of those not conversant with algebra; and with such limited views, it was not to be expected that the author should give the reasons for his solutions. He has, however, collected from the works of previous writers, the rules for solving many questions of more usual occurrence, and these he has arranged in a very plain and intelligible form, with suitable examples in numbers. To the whole there has been annexed a full reprint of the Northampton and Carlisle Tables, and a new table, not the least useful among them, showing the premium for assuring the sum of L. 100 required by all the offices in Great Britain. The treatise therefore may be useful to those possessing merely a knowledge of arithmetic, who would wish to try the solution of questions in life contingencies, but it is calculated rather to spread the knowledge of such

matters among that class of the community, than to add any thing to the progress of the science.

The science has received an accession of a very different description in the report of Mr Finlaison already referred to, upon the evidence and elementary facts on which the Tables of the new Government Life Annuities are founded. Mr Finlaison's observations have been made upon no less than 22,352 individuals of both sexes, chiefly nominees of Government Tontines; and his access to official documents has enabled him to trace these through every year of their lives, with an accuracy and precision, which it would be vain to expect in communities which are either affected by migration, or where there exists no evidence of the ages. The nominees in the different Tontines have, in the report, been considered, first separately, then in combinations, and the results derived from the whole are afterwards exhibited in the most distinct and accurate forms. The sexes have likewise been distinguished through the whole of this laborious and careful analysis, and the results obtained have been compared with M. De Parcieux's, the Northampton, and Carlisle observations, and with those also made by Mr Davies, from the experience of the Equitable Assurance Society. In short, as we have before remarked, there seems to have been nothing omitted, which, in the present state of information, could tend in any manner to fix the correct law of mortality prevailing throughout the British Empire, upon a secure and incontrovertible basis.

There are many of the remarks made by Mr Finlaison in the introduction to his report, which may be interesting to our readers, and which, considering the evidence on which they have been made, must be of the highest importance. The first to which we may refer regards the probability of life in old age: this in the Irish Tontines was so much greater than appeared from Dr Price's Tables, as to give rise to an opinion that a fraud was practised on the Managers by Nominees who had died being personated by others. "About twenty years ago," Mr Finlaison has observed, "assertions that such things were practised so far prevailed, that Parliament appointed a Select Committee to inquire into the Irish Tontines, the nominees of which were discontented at their own unreasonable longevity, be-

cause they would not die off so fast as Dr Price predicted; but I think the Committee reported that *Dr Price* (not those who managed the Tontines) was materially in the wrong, and of this fact there is abundant evidence in the subsequent observations." This point, therefore, may now be considered to be set at rest, in a manner certainly not in accordance with what Dr Young has advanced in the observations before quoted.

Mr Finlaison has remarked further, that no observations other than those of his, have ever to his knowledge been published, the foundation of which rests on the same or similar indispensable materials. Those of Kersseboom and De Parcieux, which approach the nearest to it, are defective in the points which have been already noticed, and the other tables which have appeared, have been deduced from statistical materials of a parish, city, or entire kingdom. Many circumstances, however, have been pointed out, to prove the manifest deficiency of these for the purpose of obtaining a correct law of mortality. For one thing, the census of the place at the commencement and conclusion of the observations can almost in no instance be accurately procured, and, besides, the population, could they all be discovered, have neither interest nor inclination voluntarily to disclose their exact ages. Similar difficulties occur in procuring the number of births, and of deaths at every age, which are frequently omitted to be recorded, and the place must be limited indeed, to admit of an accurate account being kept, as well of those who leave it, as of new settlers, with the sex and ages of each. It is the object of the theories given for the construction of Tables of Mortality, to obviate in part the deficiencies here noticed, but with what success this has been accomplished will best appear, by quoting Mr Finlaison's remarks on the subject. "If it be again contended, that observations on Statistical Bills of Mortality furnish, nevertheless, sufficient approximations to the truth, I would beg leave respectfully to inquire whether any such approximation may not in fact be an approach to some ideal standard of truth, existing only in the mind of the calculator, rather than to the truth itself, of which perhaps no certain criterion has heretofore been discovered.

"The question is, whether what is called '*the Law of Mortality*' be not something more than a mere average, such as the

experience of what commonly happens in regard to accidents by fire and shipwreck? or whether, indeed, it may not be a law of nature, constant under certain known modifications, exerted with unerring precision by ascertainable gradations, and capable of being traced, and very clearly elucidated, by the accumulation of facts exhibiting the very truth, the whole truth, and nothing but the truth? Now, this elucidation is plainly impossible; and the law of Nature, if indeed any such exist, must be for ever problematical, unless the elementary materials on which it is exerted are set forth with the most severe and rigorous exactness; and it is because, with the utmost respect for my predecessors in this labour, that I doubt if the task has hitherto been begun to be performed with that accuracy which is really attainable, that no pains have been spared on the present occasion."

In a subsequent part of his introduction, Mr Finlaison has considered the question, whether the Law of Mortality, ascertained by him in the manner mentioned, be a universal rule, equally applicable to the human species throughout Europe, in all districts of the same country, and among all classes of people in the same district? and upon this he has observed, "The question, as solved by me, is restricted to the mortality prevailing in the British Empire, and it is as yet matter of uncertainty what is the exact rate of mortality in any foreign country; but, from such materials as are extant, there are sufficient means of concluding that it is, as *a priori* it naturally would be, very different here, from what prevails in many other places, varying materially in climate, means of subsistence, and in the advancement in such arts as contribute to human comfort.

"The question, as solved by me, is not restricted to the population of a particular town, city, or district of England, but is applicable, on the contrary, to persons spread over every part of the empire; a large portion, however, being naturally inhabitants of towns, from their having yearly incomes to live on, which infer the means of easy intercourse in society.

"Lastly, the question, as solved by me, is restricted to the higher and more affluent orders of society, composing, in fact, the vast majority of those who have any concern with pecuniary transactions depending on the tenure of life. The rate of mortality affecting exclusively the industrious and the labouring and

indigent classes, is altogether unknown. But, considering that the latter form the great bulk of the population at large, *it may, perhaps, be concluded from the Carlisle Table, that there is very little, if any, heavier rate of mortality affecting the lower, than that affecting the affluent classes, notwithstanding the many advantages that these can command.*"

Mr Finlaison has proceeded next to inquire, whether, among the middling and higher classes, upon which his observations are made, the rate of mortality may not have varied, even in the British Empire, in the course of a long period of time, from the increase of wealth and progress of civilization, the improvement of medical science, and other causes. Upon this he has observed, that the facts ascertained by his observations, which are arranged chronologically, leave no doubt "That the rate of mortality in England has, during the last century, diminished in a very important degree, on each sex equally, but not by equal gradations, nor equally at all periods of life; and that, while in regard to the males, it seems in early and middling life to have remained for a long time as it stood about fifty years ago; in respect of the females, it has, during the same time, visibly and progressively diminished to this day, by slight but still sensible gradations."

There are many other points of great interest and importance in Mr Finlaison's inquiries; but from the length to which our observations have extended, we can afford room only for a few of them.

The first which we may notice relates to the greater longevity of females. This, as we have already remarked, has been long known, though, as the admission of the fact would tend to decrease the premiums for insurance on female lives, the offices, with perhaps one exception, have considered it better to pay no attention to it. It appeared from De Parcieux's tables for the monks and nuns, that conventual rules, and a life of celibacy, had no effect in shortening the lives of females, but quite the contrary below the age of 50; after which age, however, the mortality, as shown by his tables, becomes very severe, whether from the monotony and austerities attending such a mode of existence, or from other obvious causes, it may not be very easy to determine. With regard, again, to females of the middle

and higher classes in the British Empire, Mr Finlaison's observations remove all doubt whatever, that, whether married or single, their lives, throughout the greater part of their existence, are decidedly better than those of males. These observations, he has stated, "demonstrate, that, except under the age of 12 and above the age of 85 (extreme periods in which, perhaps, no distinction of the mortality is apparent), there is, at every other period of life, a remarkable and decided advantage in favour of the female. This is first most evident about 14, after which the mortality among the female sex is observed to proceed onwards to the age of 55, with the slightest imaginable increase, contrary to many received notions, that child-bearing and nursing entail on this sex a severe mortality in early life, and that in the earlier stages of the decline of life they are also subject to many casualties, all which is utterly disproved by the fact. It is not true, but quite the contrary, therefore, that married women incur greater danger than the single; and reasonably may this conclusion be admitted, when it is considered that the married are, in the first instance, in regard to health and strength of constitution, always the *elite* of the whole sex, the unhealthy not choosing to marry. After 60, the female mortality advances more rapidly, but is always, until the age of 80 at least, very decidedly less than that of the males.

"Among males, on the contrary, after the age of 14, a remarkable increase of mortality occurs, which rapidly advances till the age of 23; it then diminishes till 33; very slightly rises again and falls alternately till the age of 49, when it stands at the same point as at 23. From 49, the decline of life commences on the side of the males the same as with regard to the females; and these occurrences are manifested in almost every one of the observations, a matter that cannot be referred to accident."

The only other points in Mr Finlaison's inquiries to which we shall at present refer, relate to the extreme period of existence, and selected lives. Upon these he has observed, "If any one should say that the gradual prolongation of life, and that more especially among the females, implies an extension of the term of human existence, the increase of centenarians, and so on, I beg leave to disclaim the intention of such a meaning.

The extreme term of existence is not surpassed, because a greater number under the same favourable circumstances approach it. Among the 22,352 nominees registered by me, there was only one instance of a person passing the age of 98, an old lady at Wimbledon, who lived to be 100 years old.

“ There remain in this discussion still more than one or two questions, which are, however, of much importance ; but they cannot be propounded on the present occasion without much further inquiry, although they are, and, as I hope, will yet be found, capable of complete solution. The most interesting is, in what degree, if any, are picked and chosen lives (such as those presented at an insurance office), superior in longevity to the rest of the same rank in society, from among whom they are so chosen ? Without entering on this question, I may venture to state concerning it, that no small pains have already been taken to arrive at certainty ; and, if a mere opinion, founded on what has yet appeared, be worth notice, it is this, *that there is very little, if any advantage at all, in favour of selection.*”

It seems almost unnecessary to add any thing to what Mr Finlaison has stated in regard to the imperfections of those tables, derived from statistical materials, which are in general use, as, in a certain degree, they are now generally admitted to be imperfect and erroneous. The great object all along has been, as we have already stated, to ascertain the full extent of their irregularities, and to fix the law of human mortality prevailing in the British Empire, from the actual experience of a sufficient number of lives, traced throughout their whole existence, without any theoretical rectifications for migrations or otherwise. This object, therefore, has now been attained with every conceivable accuracy by the observations of Mr Finlaison ; and a comparison of his with other tables, is, in fact, to bring the latter to the test of experience, so far as such a test is likely to be ascertained by human means.

To facilitate such comparison, we have prepared a *table, showing the value (or number of years' purchase) of an annuity at every five years of age from 15 to 90, at 4 per cent. interest, according to the observations made at Northampton, at Carlisle, and to those of Mr Finlaison for male and female lives sepa-*

rately. From this table we have likewise calculated another, showing the annual premium required for assuring the sum of L. 100 on single lives at every five years of age from 15 to 60, according to all these observations; and at the same rate of interest.

From the *first* of these tables it appears that the prices of annuities, according to the Carlisle observations, are higher, except at the age of 60 (in old age greatly higher) than those for annuities to males, according to Mr Finlaison's observations, and that they are lower than Mr Finlaison's for annuities to females, except in extreme old age. The prices, according to the Northampton tables, however, are, throughout, much lower than either Mr Finlaison's for males, or the Carlisle, except after the age of 85, when they are only exceeded by the Carlisle.

From our *second* table, again, it will be seen that the differences among the above-mentioned observations operate in a contrary way in cases of assurance. That is to say, the premium required for assuring the sum of L. 100, according to the Northampton observations, is much greater than according to the observations at Carlisle, and to those of Mr Finlaison. For female lives, judging from Mr Finlaison's observations, it is almost double of what it ought to be.

Yet the premiums charged by the assurance offices are formed all, more or less, upon the Northampton observations, and they will, no doubt, continue to be so, though known to be perfectly extravagant and unequal, so long as people can be found to pay them.

The errors of the Northampton tables have been dwelt upon by almost every author who has considered them; and, indeed, from the assumptions on which they were constructed, it is impossible that they can be otherwise than very greatly erroneous. So long ago as 1810 this was forcibly pointed out by Mr Baily, who instituted a comparison between the rates charged for assurances, according to the Northampton tables, and the rates which he conceived ought to be charged. It appeared, he has observed upon this comparison, "That the several assurance companies require, in most cases, half as much again as ought to be given; and, in some cases, nearly *double* the sum that should be given for the assurance. And though some compensation ought to be allowed for the expenses incurred in car-

rying on the business of the office, as well as a proper remuneration for the services of those who conduct it, yet it is evident that these sums are greater than ought reasonably to be taken, particularly when it is considered that those who insure at any of the offices, for a *term* of years only, have not much prospect of deriving any advantage from the profits of the concern."

In speaking further of the Northampton tables, he has stated, "A more just and equitable scale *ought* to be adopted by those societies who do not make any return to the assured, of the vast profits that arise from this species of daily traffic, and would tend more to the increase of their business in this way, and would likewise be more honourable to themselves, than the disgraceful practice of *bribing* solicitors, agents, and others, to effect assurances at their offices, thereby notoriously inducing those parties to *sacrifice* the interests of their employers and their friends. For the money which is applied to this base purpose can be considered in no other light than as *unjustly* taken from the pockets of the *assured*, and would be more properly and equitably employed in being appropriated towards a reduction of the rate of assurance, since, if the company can afford to allow it to the agent, it surely can afford to allow it to the principal; and it evidently belongs more justly to the latter than to the former.

"A person of this age (20), who insures the above sum (L.5000) at any of those offices, which make no return of any part of the premium, may be considered as *throwing away* between seven hundred and a thousand pounds."

The Parliamentary Committee on Benefit Societies (year 1825), after a minute investigation, and an examination of the most able actuaries in Britain, came also to the conclusion, "That the experience of the offices for Insurance on Lives has proved the Northampton Tables to be much more unfavourable to human life than the purposes of those offices require." But, notwithstanding the mass of evidence contained in the Report of that Committee, and it may now almost be said the universally admitted inaccuracy of the Northampton observations, we remark, upon comparing our second table with that showing the premiums required by all the offices in Great Britain; that many of those offices have adopted the Northampton observations without any modification, taking interest at the rate of 4 per cent. The premiums charged by them, therefore, after

deducting their per-centage for expenses of management, agree precisely with those which we have calculated from the Northampton tables. The premiums of some of the other offices are derived by blending the Northampton and other observations, as they agree with no rate of mortality which has ever been observed; and the premiums of all the offices, with the exceptions of those required by the Asylum and Promoter at the ages of 15 and 20, are above what, according to Mr Finlaison's observations, they ought to be, though the excess is very unequal, being at some ages much greater than at others.

The very unaccountable differences among the rates charged by the offices, would lead one to suppose that the science remains in a much more imperfect state than it really does. It would seem that scarcely any two actuaries have been able to agree upon a rate of mortality; and when they have not blindly followed the Northampton observations, the choice of some others to qualify these, appears to have been decided from a love to some striking and new theory, rather than upon any sound or rational principle.

It is right that the offices should be fully and fairly remunerated for the risks they undertake; but, whatever may be a suitable rate of profit, it is surely unreasonable that it should be assessed upon a person at one age more than at another; and although security ought to be a principal object with the offices, it is questionable if even this will be best attained by adopting too low a rate of mortality; to some it has appeared that it would not, and we may, in particular, refer to the observations made on that point by a leading actuary in his examination before the Parliamentary Committee on Benefit Societies (year 1827). "I strongly object to using tables giving a greater mortality than is expected to take place, a course which has sometimes been defended on the ground of safety to the establishment. Safety is much more certainly secured by judging, as nearly as possible, the true risk, and adding an additional sum for security. If tables, not representing the mortality of the class for whom they are designed, are employed, every step in the reasonings which are deduced from them is liable to increased error; and if the calculations are at all complicated, the errors so introduced may not improbably act on the opposite side to that which they were introduced to favour."

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In conclusion, we may observe, that some of the offices which adopted the Northampton observations, seem to have calculated from the outset, that the expenses of their establishments would be paid, and the proprietors fairly remunerated, by a charge of 2½ per cent., or even less, upon the premiums. As might have been anticipated, at every periodical investigation into the affairs of such companies, the proprietors have been congratulated upon what has been called the *unforeseen* and progressive improvement of their funds, which in practice it has been found much more agreeable to ascribe to the superior management of the directors than to the errors in the scale of charges. These errors are in some sort compensated, though certainly very unequally, when the assured are allowed a participation in the profits; but there cannot be any question that it would be a much more plain and honest course to allow the surplus profits which must infallibly result from the use of the Northampton Tables to remain in the pockets of the insurers, and to reduce the premiums required from them to the rates which experience has shown, and must ever continue to show, to be all that are requisite or reasonable.

TABLE, showing the Value of an Annuity on a Single Life, at 15, 20, &c. years of Age, according to the observations mentioned below, taking the rate of interest at 4 per cent.

AGE.	DR PRICE, Northampton.	MR MILNE, Carlisle.	MR FINLAISON'S Observations.	
			Males.	Females.
15	£ 16.791	£ 18.956	£ 18.004	£ 19.059
20	16.033	18.363	17.295	18.613
25	15.438	17.645	16.940	18.127
30	14.781	16.852	16.444	17.547
35	14.039	16.041	15.749	16.880
40	13.197	15.074	14.875	16.156
45	12.283	14.104	13.798	15.269
50	11.264	12.869	12.430	14.161
55	10.291	11.300	11.039	12.790
60	9.039	9.663	9.721	11.261
65	7.761	8.307	8.216	9.577
70	6.361	6.709	6.775	7.858
75	4.962	5.239	5.410	6.264
80	3.643	4.183	3.812	4.936
85	2.543	3.115	2.349	3.751
90	1.758	2.416	1.331	2.113

TABLE showing the Annual Premium for an Assurance of £ 100 on Single Lives, at the ages of 15, 20, &c. according to the observations mentioned below, taking the rate of interest at 4 per cent.

AGE.	DR PRICE, Northampton.	MR MILNE, Carlisle.	MR FINLAISON'S Observations.	
			Males.	Females.
15	£ 1 15 6	£ 1 3 4	£ 1 8 4	£ 1 2 9
20	2 0 6	1 6 4	1 12 5	1 5 0
25	2 4 9	1 10 4	1 14 7	1 7 8
30	2 9 10	1 15 1	1 17 9	1 10 11
35	2 16 1	2 0 5	2 2 6	1 14 11
40	3 3 11	2 7 6	2 9 1	1 19 8
45	3 13 8	2 15 6	2 18 3	2 6 0
50	4 6 2	3 7 3	3 12 0	2 15 0
55	5 1 8	4 5 8	4 9 3	3 8 1
60	6 2 4	5 10 8	5 9 8	4 6 2

EDINBURGH, June 1830.

A. G.

[Calculations relating to Life-Interests and Survivorships are of constant occurrence in the business of life, many of the most important domestic arrangements of families and individuals frequently depending upon them. The principles of Benefit Societies, also, being founded upon the rate of sickness and mortality amongst the labouring classes, require the same species of calculation as has been considered in the above interesting communication, for which we have pleasure in expressing our acknowledgments to an esteemed correspondent and able mathematician: and when we regard the uses of these provident institutions as a means of improving the habits and condition of the labouring classes, and thus tending to alleviate the burden of the heaviest tax that now falls upon the landed property of this country—the poor's rate,—our judicious reader will perceive, that, in devoting a portion of our Journal to a consideration of the law of mortality, with relation to its effects on life-interests, we have not been deviating into an inquiry foreign to the purposes of our work.

The law of human mortality, too, as connected with the rate of increase of the numbers of mankind, has given rise to many interesting inquiries, and produced conclusions, the influence of which has not been confined to the closet of the philosopher, but has extended to the affairs of life, and to the reasoning of statesmen. In our present number we propose to direct the attention of our readers to this subject, under the head of what may be termed Theories of Population.—EDITOR.]

ON THE INDIGENOUS TREES OF NORTH BRITAIN. *By*
WILLIAM MACGILLIVRAY, Esq. M. A. &c.

IT would appear from historical evidence, and the relations of travellers who have visited countries that have received little modification from the interference of man, that the original and natural vegetation of nearly all parts of the globe, excepting such as are covered by shifting soil or perennial snows, consists chiefly of trees and shrubs, differing according to the climate. When the restless natives of Europe first visited the different regions of America, they found them overgrown with forests. In those regions of Asia, whether continental or insular, in which they have settled, the unreclaimed tracts were covered by impenetrable jungle. The Romans, in their European conquests, had to force their way, not with sword and spear only, but also with axes and firebrands; the maritime regions of Africa are still woody; and in all these portions of the globe, wherever the inhabitants have not betaken themselves to agricultural or civic occupations, woods and thickets spread on all sides. In Europe, the Hercynian Forest has been reduced within small limits, the Caledonian has disappeared, and its very roots have been grubbed from the soil; but Norway, Sweden, and Russia, are still to a great extent covered by natural forests. The parched and sandy deserts of Africa and Asia, the savannahs of America, and the grassy islands and coasts of the colder regions of both hemispheres, together with the more elevated parts of the great mountain ranges, some alluvial tracts along the course of rivers, and the frozen lands of the Poles, have perhaps been always destitute of wood, although in all cases as much may be said in favour of the one opinion as of the other. If, after the revolutions and catastrophes which geology so clearly indicates, the surfaces consisted partly of bare rock, and partly of debris, gravel, sand, and clay, whatever may have been the first vegetation by which these surfaces were covered, it is at least apparent that trees were abundant upon them at a period antecedent to the formation of peat and other soils of vegetable origin; for the decayed stumps and roots of the oldest trees which we meet with

may generally be traced to the subsoil, and in few cases occur in soil that is evidently of posterior origin.

A considerable portion of Scotland can hardly be supposed to have been covered with trees for many ages back ; for in the soil and subsoil the operations of the agriculturist disclose no roots, which, had they once existed, could scarcely have been so entirely decomposed as to leave no traces behind. But the sides of all the Highland mountains, the glens and ravines, the margins of the rivers and lakes, and very extensive tracts of the low grounds, have at some period been covered by wood. With respect to the species of trees which occurred in those early periods, when the country presented an almost uniform continuity of forest, history affords little satisfactory information ; for the accurate discrimination of vegetables has never formed part of the qualifications of the historian, and even at the present day, we find writers of celebrity committing the most glaring mistakes in every thing that relates to natural history. Beyond the mere fact, therefore, that, at a former period, Scotland exhibited extensive ranges of uninhabited forest, where corn-fields and pastures now surround the habitations of a crowded population, little is to be learned from the pages of our historians. They can only tell us at random of " noble forests of oak, ash, beech, and other hard timber," and to discover the species of which these forests were composed, we must have recourse to our peat bogs, and to the remnants of the ancient woods which still grace many parts of the country.

From the former source, little information is to be obtained. When trunks, branches, or roots are found in peat, they are generally so altered that the species to which they belong can only in few cases be discovered. The pine, the birch, the alder, and the oak, are all that can be made out with certainty, to which may be added the hazel, upon the evidence of its nuts, which sometimes present themselves.

In an insular situation like ours, it is evident, that, unless new species spring up spontaneously, no addition can by natural means be made to the original stock. The trees of England are the same as those of Scotland, with the exception of a few species which have not made their way to the latter country. Shrubs or young trees wafted from the European or American continents, would necessarily perish before arriving upon our coasts ;

and the seeds of none of our present species of trees are fitted for long aerial voyages, and could scarcely arrive from the nearest point of Europe, even if whirled from thence by a hurricane. As to the dissemination of trees by birds, I have only to say, that I have never found an entire seed of any kind in the intestines of a bird, and that the hardest kinds are shattered by the least muscular gizzards. The present indigenous trees of the country are, therefore, very probably the species of which its ancient forests consisted. Some species may indeed have been lost, but of this there is no evidence. The beech, which Mr Tytler says existed in our ancient forests, is now nowhere to be seen wild; but what evidence is there that it ever occurred so? Even in England, its right to a place in the Flora is disputed; and although Ray says it was in his time common in the south of England, Cæsar asserts that neither it nor the fir (*Abies*) was observed by him there.

In examining a country with reference to its native trees, one would naturally betake himself to the wildest and least inhabited districts; for in those which have been reduced to a state of fertility, the woods, however much they may appear to be the un-mixed produce of the soil, may have been modified by the interference of man. For this purpose, along with others of a similar nature, I have traversed nearly all the most interesting districts of Scotland; and the result of my observations, I trust, may prove not unworthy of the notice of those who are interested in the natural history of this portion of Britain. There is, in reality, no distinction between trees and shrubs; but, as an enumeration of the latter would occupy considerable space, I shall defer it for the present. The species of trees which I have observed and examined in a wild state in Scotland and its islands are the following.

1st, The Scotch Pine (more commonly, but less correctly, called Scotch Fir), *Pinus sylvestris*, named by the Highlanders *Craobh-ghiubhais*, is the largest of our native trees. No idea can be formed of the native pine of this country from the samples one sees in plantations; but in the remains of the great natural forests, especially when it grows in dense masses, as it generally does, to the exclusion of other trees, it presents a magnificent spectacle. In its perfect state, the pine is straight, and attains a height of from 50 to 80 feet or more. The trunk does

not send off permanent branches excepting towards the summit, unless when the tree happens to grow in an open place, when it forms arms like the oak, but does not attain its usual height. The bark is pale brownish red, and scales off in thick irregular pieces. The leaves remain during the winter. They grow in pairs, forming tufts or bundles, and are linear, straight, smooth, channelled and dark green above, convex and somewhat glaucous beneath. The cones are about two inches long, egg-shaped, pointed, and tuberculated. The wood in most situations is whitish, but in dry and elevated places reddish or yellowish, and resinous. Its qualities and uses are well known; as are those of the turpentine and resin which it yields. The bark has been used for tanning, but is inferior to that of several other native trees. This fine tree was formerly very generally distributed in the Highlands; but wherever the forests were near the sea, as on Loch Maree, they have been cut down, and in many places there only remain of them a few straggling and diminutive individuals. In various parts of Aberdeenshire, along the course of the Dee, as well as on the Spey, in Glenmorison, Strathglass, and a few other places, great woods of this tree are still to be seen. In the forest of Glenbeg, according to the Rev. Mr Farquharson, there are many individuals upwards of 10 feet in girth. Dr Hooker, in his British Flora, says, a plank from the largest tree that was cut down in the Duke of Gordon's forests of Glenmore measured $5\frac{1}{2}$ feet in diameter (or $16\frac{1}{2}$ feet in girth). In shallow soil, where the roots are unable to penetrate, it is surprising to what extent they sometimes spread. The roots, in some parts of Scotland, are split into thin pieces, and used in place of candles.

2. The Common Oak, *Quercus Robur*, named vernacularly by the Lowlanders in some parts *Aik*, by the Highlanders *Darack*. In Scotland, the oak, in its native stations, is generally an insignificant tree, seldom attaining a diameter of a foot and a half, or a height of forty. It is only when planted in rich soil, that it makes some attempt to rival the gnarled oak of England. The trunk rises to a considerable height before branching, and is frequently straight, with longitudinally fissured dark grey bark. The branches are smooth, the leaves alternate, smooth, bright green, unequally cut into obtuse, entire, parallel lobes. The barren catkins are pendulous and stalked; the fertile flowers few, sessile, on long axillar stalks. This species is

very common in the Highlands and Inner Hebrides, where it forms extensive woods, which are cut down at regular periods for hoops and poles, and more especially for the bark, which is perhaps better than any other for tanning. A decayed oak, by the road between Inversanda and Strontian in Argyleshire, was found by Dr Walker, in 1764, to measure in circumference near the ground 17 feet 8 inches. Wallace's Oak in the Torwood is stated by the same author to have been in circumference, four feet from the ground, 22 feet. On the north side of Loch Arkeg in Lochaber, he also found an oak which was 24 feet 6 inches in circumference, at the same height. These, however, are the giants of the land, and for every oak two feet in diameter there may be found a thousand not more than one. In the days of Ossian, the oak was probably of larger size than it is now, for he mentions it as an emblem of strength and stability.

3. The Common Birch, *Betula alba*, named by the Lowlanders *Birk*, by the Highlanders *Beithe*, is a tree of great beauty. Its trunk is seldom straight, but frequently attains a considerable height before branching. The outer bark is white, and naturally bursts in large scales or patches; but in old trees it disappears, and the bark is deeply divided by irregular dark-coloured clefts. The branches are slender, and the twigs in old trees always drooping at the extremities. A variety with the branches more pendulous than usual, is called the *Weeping Birch*. The leaves are egg-shaped, pointed, unequally serrated, and deep green. The catkins, which appear before the leaves, are stalked and pendulous; the fertile ones short and oval. The usual height of this tree is from 30 to 40 feet. It seldom exceeds two feet in diameter, although I have seen very old trees in Loch-Carron and other districts which were upwards of twelve feet in circumference. In the forest of Darnaway, in Morayshire, there were many birches nine feet in girth; (Stat. Hist. vol. viii. p. 557). This species is very extensively distributed. Of many large woods in the Highlands it forms the sole constituent, as on the northern side of Lochlagan, in the braes of Loch Carron, the upper part of Glenmorison, &c. It grows at a greater elevation than most others, and descends along the rivers to near the level of the sea. The bark is used for tanning. The wood, which is hard and white, is employed by the wheelwright and turner in

the manufacture of various implements and utensils; the branches form hurdles and in some of the Highland districts are woven between poles to form the walls of barns. The sap is sweet, and is said by many writers to be collected in the Highlands for the purpose of making "a kind of rustic wine;" but I have never seen a sample of this wine, or a person who had seen it.

4. The Dwarf Birch, *Betula nana*, although a very rare, and at the same time a very diminutive tree, may be here mentioned on account of its affinity to the preceding. It hardly ever exceeds the height of five feet, and is frequently still lower. The leaves are roundish, smooth, acutely crenate, on short stalks, with two lance-shaped stipules at the base. The catkins are oval, erect, and stalked. I have not met with it elsewhere than in the desolate tract between Bennabuir and Castletown of Braemar, but several other stations are mentioned by Lightfoot and Hooker. For a beautiful account of this interesting plant, see the Flora Lapponica of "the immortal Swede." It is not applied to any use in Scotland.

4. The Alder, *Alnus glutinosa*, vernacularly named *Aller*, and by the Highlanders *Fearna*, grows in moist or marshy ground, especially along the margins of streams, which it aids in beautifying. In most parts of Scotland, it merely presents the form of a dense bush, from 10 to 20 feet high; but in favourable situations, it shoots up into a tree, sometimes to the height of from 30 to 40 feet. The wood is red, hard, and brittle, and is not much esteemed, although it lasts under water longer than any other native wood. The trunk is generally crooked, as are the spreading branches. The bark of the former is dark-coloured, cracked, and fissured. The young branches and leaves are covered with a glutinous substance. The latter are roundish, obtuse, serrated, plaited, deep green, glossy, with transverse straightish veins from a central rib. The stipules are roundish and entire. The barren catkins are long and pendulous; the fertile ones short and egg-shaped.

6. The Hazel, *Corylus Avellana*, in Gaelic *Culltain*, is very common in most parts of the Highlands. It is of small size, seldom attaining a height of more than 15 feet. It generally grows in the form of a bush, with numerous stems. The bark is grey and smooth. The branches, when young, are rough,

with short hairs. The leaves are large, broadly egg-shaped, doubly serrated, light green, downy on both sides, but especially beneath. The barren catkins are clustered, long, and pendulous; the fertile flowers in short tufts, tipped with crimson stigmas. The nuts are half covered by the outer calyx, which has become greatly enlarged and leafy. The wood is white, tough, and pliant; and the branches and twigs are used for hoops, walking-canes, and rustic fishing-rods. The wood is said to make the best charcoal for drawing.

7. The Aspen or Trembling Poplar, *Populus tremula*, in Gaelic *Criothann*, is one of the most elegant of our native trees. Its trunk is generally straight, and has a greenish-grey, smoothish bark. The young branches are hairy. The leaves are roundish, shortly pointed, toothed, smooth on both sides, light green above, pale beneath, three-ribbed, on long stalks, which are vertically compressed, weak and flexible at the top, on which account the leaves are continually moving from side to side with the slightest motion of the air, a circumstance correctly noticed even by the poets. The barren catkins are long, loose, and pendulous; the fertile ones shorter, with crimson stigmas. The wood is white, softish and light, and is used for various domestic purposes. In the gullies, and in rocky places along the course of rivers, no species is more common than this in most parts of the country.

8. The Yew, *Taxus baccata*, in Gaelic *Iudhar*, is of very rare occurrence. I have not met with it anywhere in Scotland; but it is mentioned by Lightfoot as occurring in Glenure, near Glen Creran, in upper Lorn; and by Dr Walker, in the Island of Bernera, adjacent to the Sound of Mull, and in Inch Lonach, in Lochlomond, where there is a large wood of it. The trunk is straight, with smooth dark-coloured bark. The leaves are evergreen, linear, dark green and shining above; paler with a prominent rib beneath. The berries are bright red, mucilaginous, and hollow at the top. The wood is red, hard and tough.

9. The Common Ash, *Fraxinus excelsior*, in Gaelic *Uinsionn*, is one of the most beautiful of our native trees. Its bark is pale greenish-grey, and smooth. The branches are large and spreading, and the twigs thick and brittle, terminated in spring by

large black buds. The leaves are pinnated, having five or six pairs of lance-shaped, serrated, bright green leaflets, with a terminal one; the common stalk channelled. The leaves are later in coming out than those of any other native tree. The flowers are small, and consist of a pistil and two stamens, without calyx or corolla. The capsule contains one or two seeds, and is terminated by an oblong leaf-like expansion. The wood, which is white, hard and tough, is much used for agricultural implements and other purposes. Some doubts being entertained as to the claims which this species has to rank as a native plant, it may be right to enumerate the stations in which I have seen it undoubtedly wild. They are the following :—

In a valley named Glenappe, near the mouth of Loch Ryan, on the north side, along with Birch, Hazel, Alder, Hawthorn, and Sloe.—Along the sides of Lochlomond, between Tarbert and Luss, together with the Oak, Mountain-ash, Alder, Crab-apple, Sloe, Holly, White Birch, and Hawthorn. It is there very beautiful, and grows to a large size.—At Cladich, on Lochawe, the thickets consist of Hazel and Oak, intermixed with Ash, Bird-cherry, White Birch, and Hawthorn.—On the hills at the Pass of Ballater, and for two miles above Upper Branchory, on the Dee.—In the wood of Ord in Skye, along with the Hazel, Birch, Alder, Bird-cherry, and Hawthorn.—On the brinks of the precipices at the Fall of Foyers, along with the Fir and Birch, in the romantic pass of Altmore, and in many other places along Loch Ness.—Thinly scattered along the hills which enclose Loch Maree in Ross-shire, together with the Oak, the Aspen, and the Mountain-Ash.—Between Fort-William and Glenco, along the shore.—In Aberfoil, along the river and by Lochard.—Along the sides of Loch Kateran, and in many other places in the Highlands.

Not trusting to memory, I have extracted all the above notices from my note-books, which contain at least as many more to the same effect. In Dr Walker's *Economical History of the Hebrides*, I find two passages to the purpose. They are as follows :—In the Island of Isla, in the natural coppices, “the ash seemed to thrive best. Some trees of this sort, which had accidentally escaped the ravages of the cattle, were above 30 feet high, and fresh and vigorous.” Vol. ii. p. 278. “In Skye, on the north side of the bay of Oronsay, there is a tract of about 150 acres, with a great deal of coppice upon it, and the remains of some very large trees of ash, birch, alder and rowan.” Vol. ii. p. 279.

10. The Broad-leaved Elm, or Wych Elm, *Ulmus montana* of Smith, in Gaelic *Leamhan*, is not common in any part of Scotland which I have visited. It is a tree of ordinary size, and little beauty, with a generally crooked trunk, covered with longitudinally and irregularly fissured dark-grey bark. The leaves are large, resemble those of the hazel, and are broadly elliptical or inversely egg-shaped, taper-pointed, doubly serrated, rough with short hairs, deep green above, paler beneath, with transverse straightish ribs from the central one. The bunches of seeds resemble hops in all the species, but in this they are peculiarly large and conspicuous. It grows in some of the Highland glens, and on the banks of rivers and other woody places in the Lowlands. I have also seen it in the Outer Hebrides, among the stunted remains of their ancient woods, particularly in the Glen of Rodill in Harris. The wood is whitish, hard, and tough.

11. The Bird-cherry, *Prunus Padus*, named in some parts of Scotland *Hagberry*, is a small tree, from 10 to 20 feet high, with dark-coloured, roughish bark, smooth branches, and inversely egg-shaped, pointed, serrated, smooth leaves, having two small brown glands at the base. The flowers are white, in long pendulous clusters, which have a very beautiful appearance. The fruit is small, round, black, harsh and nauseous. This tree is very common in many of the Highland woods, as in Glenco, by the sides of the Linne Loch, by Lochlomond and Loch Kateran, as well as in the woody parts of the Lowland districts.

12. The Wild Cherry, *Prunus Cerasus*, commonly named in Scotland the *Gean-tree*, attains a much larger size than the last, the trunk being often upwards of a foot and a half in diameter. The bark is light-grey and smooth. The leaves are egg-shaped, pointed, serrated, glandular at the edges, smooth above, hairy beneath, with two brown glands on the top of their stalk. The flowers are white, in umbels, on long stalks. The fruit is globular, brownish-black, sweet and wholesome. This is supposed to be the origin, or a variety, of the Common Cherry-tree, which it resembles in every thing but the hairiness of the leaves, and the different size and colour of the fruit. In the Highlands it is not common, but it is abundant in many parts of the Low Country, as in Dumfriesshire, at Rosslyn, and along the lower part of the Dee. The wood is hard and reddish.

13. The Sloe-tree, or Black-thorn, *Prunus spinosa*, vernacularly named the *Slac*, and in Gaelic *Preas-nan-airneag*, is very common in all parts of Scotland, growing in woods, thickets, and hedges, and more especially on dry banks along the sides of rivers. Its numerous white flowers which appear early in spring, before the leaves, have an agreeable appearance, but, unless as a nuisance, the plant does not seem to deserve much attention.

14. The Hawthorn, or White-thorn, *Mespilus Oxyacantha*, named in Gaelic *Sgitheach*, is extensively distributed in Scotland, growing in most of the woody parts of the low country, and in the glens of the Highlands, interspersed among other trees. It generally forms a bush of from 10 to 20 feet in height. The bark of the stem is dark brown, and separates in irregular scales. The branches, which are slender, are covered with awl-shaped, lateral thorns. The leaves are alternate, stalked, three- or five-lobed. The flowers are in terminal corymbs, white, and exhale a delightful scent. The wood is white and very hard, but is seldom procured of sufficient size to be useful.

15. The Wild Apple or Crab-tree, *Pyrus Malus*, in Gaelic *An Abhal-fadhaich*, which is a low bushy tree, with spreading, irregular branches, elliptical, serrated leaves, and beautiful umbels of rose-coloured flowers, does not appear to be of common occurrence in Scotland; and the only places where I have seen it undoubtedly wild are in the district of Sleat in Skye, and along the western shores of Lochlomond.

16. The Mountain Ash or Roan-tree, *Pyrus Aucuparia*, named by the Lowlanders *Rowan-tree*, *Roddan-tree*, and *Ran-tree*, and by the Highlanders *Craobh-chaorain*, is one of the most elegant of our native trees. Its height is from 10 to 40 feet. The trunk is straight, with greyish, smooth bark. The branches, which are at first nearly erect, and afterwards spreading, are tinged with red towards the tips. The beautiful pinnated leaves have lance-shaped, serrated, smooth leaflets, at first downy beneath. The flowers are yellowish-white, fragrant, and grow in large corymbose panicles, producing scarlet berries. The wood is white, tough, but not very hard, and is employed for various purposes. In the north of France a spirit is distilled from the berries, but it is probable they will never be used in this country

for such a purpose. They are the food of several species of passerine birds. No tree is more generally distributed, it being found in all the wooded parts of Scotland, although it nowhere forms woods of itself, like the fir, the birch and the alder.

17. The White Beam-tree, *Pyrus Aria*, occurs in the fissures of rocks, but appears to be rare. It is a small tree, with brownish bark. The young branches are white and downy. The leaves are elliptical or inversely egg-shaped and pointed, incised, serrated, with straight nerves, hoary with down beneath. The flowers are white, in large corymbose tufts, producing scarlet, mealy berries, which are harsh and acid.

18. A small tree which our botanists name the Bastard Mountain Ash, having characters in some measure intermediate between those of the last two species, has been found in the Island of Arran, growing in rocky situations. It is the *Pyrus pinnatifida*. The leaves are entire, stalked, oblong, acute, serrated, often pinnatifid towards the base, smooth above, white and cottony beneath. This species I have not met with. Its description may be seen in the English Flora, vol. ii. p. 366, and in Hooker's British Flora, p. 222.

19. The Holly-tree, *Ilex Aquifolium*, named by the Highlanders *An Cuillion*, occurs in many parts of the Highlands and Lowlands, generally scattered in the woods, in single trees, or growing, with the poplar and mountain-ash, in clefts of rocks. As it is easily known by its evergreen, tough, thorny and glittering leaves, I shall only say of it, that it seldom attains a diameter of two feet, or a height of 30. The wood is hard, close in the grain, and valuable. The bark abounds in mucilage, which is extracted by maceration, for the purpose of making birdlime.

20. Besides these, I have met with a species of Poplar in Braemar and by Loch Maree, which I am unable to refer to any of those described in our Floras, although it approaches the *Populus alba*. It is also probable that the Common Elm, *Ulmus campestris*, is indigenous to this country, although I cannot say with certainty that I have seen it so. The elms, in fact, are not well described, or sufficiently understood, although this species, which is common enough in a cultivated state, is abundantly distinct from the Wych Elm.

Lightfoot, in his *Flora Scotica*, has admitted the following species:—1. The Beech, *Fagus sylvatica*; 2. The White Poplar, *Populus alba*; 3. The Black Poplar, *Populus nigra*; 4. The Bullace tree, *Prunus insititia*; 5. The Common Elder, *Sambucus nigra*; 6. The Dwarf Elder, *Sambucus Ebulus*, which, however, is nearly a herbaceous plant; 7. The Wayfaring Tree, *Viburnum Lantana*. Of the two Poplars, however, he says that they are doubtful natives; and the Beech, the Poplars and the Elder, are discarded by Dr Walker, whom, in a matter of this kind, I should hold as the best possible authority. As to Dr Hooker's *Flora*, it contains whatever grows in "woods, hedges, and plantations," and therefore is of no value in the matter of indigenous Scottish trees.

To the above twenty species of native trees, are to be added ten or twelve Willows; but, as the species of this extensive genus are so ill understood as to furnish a bone of contention to our most eminent botanists, who, moreover, do not distinguish between the truly indigenous kinds and those which we so frequently meet with, planted in rows by the sides of still rivers, I shall refer the subject to more mature consideration, and, in the mean time, shall attempt to present a picture of the natural distribution of the species described.

The Shetland Islands, the Orkneys, and the Outer Hebrides, are destitute of wood, although some diminutive samples of a few species of the more common trees, as the hazel, the birch, the mountain ash, the alder, and the aspen, may, by a careful search, be found in them. These trees, or bushes, occur in gullies, in trap veins which have become the beds of streams, in clefts of rocks, by the margins of lakes, or in lacustrine islets. Trees planted in these islands thrive pretty well until they begin to overtop the walls by which they are sheltered, when the young shoots are generally destroyed each successive winter down to the level of the wall top. At Stornoway, in Lewis, some trees planted in a sheltered spot have attained a considerable size; and in the Glen of Rodell in Harris, there is a plantation, about fifteen years old, which is represented as looking well. It is certain, however, from remains found in peat-mosses, that trees once grew naturally on many of these islands, and it would be desirable to ascertain the causes which now impede the progress of

sylvan vegetation in them. The small trees which at present occur there are almost all shoots from old stumps or roots, and it is not easy to say how old these stumps may be.

The western shores of the Inner Hebrides, the headlands of the opposite coast of the Mainland, the coast of the south-western portion of Scotland, from the mouth of the Firth of Clyde to that of the Solway Firth, and the whole northern and eastern coasts, from Pollewe to Cape Rath, and from the latter to the Tweed, are more or less destitute of wood, trees occurring only in sheltered hollows, in the deep and narrow valleys called deans or dens, and along the sea lochs, or the mouths and estuaries of rivers.

The landward portions of most of the Inner Hebrides, however, are more or less wooded. The district of Sleat in Skye, and the eastern coasts of Mull, are beautifully fringed with woods and copses of birch, oak, alder, ash, bird-cherry, willows, and a few other trees. Along the numerous sea lochs, bays and creeks of the northern and middle divisions of Scotland, generally extending from the water's edge to half-way up the hills, we find woods of birch and oak, intermixed with alder, hazel and mountain-ash. The sides of the narrower lochs are generally best wooded, but even those which have considerable width, as the Linne Loch and Loch Fyne, are adorned with sylvan verdure. Many of these lochs present scenes of great magnificence, as Loch Hourn and Loch Duich ; and others of great beauty, as Loch Carron, a narrow arm of the sea, into which the tide rushes with the impetuosity of a torrent, through the craggy pass of Port-an-stræm, enclosed by rugged and heath-clad mountains of gneiss and granite, and margined with woods of birch and hazel, in the midst of which are seen patches of green pasture, covered with flocks, and little fields of yellow corn, and fern-roofed cottages sending up their thin columns of grey smoke ; while the fragrance of the woodbine and birch is floated from the thickets, and over the sunny and quiet lake the little barks have spread their brown sails to catch the breeze that is to waft them to the fishing station. Scenery like this, the velvet lawns, and gay mansions, and hedge-rows of oak and elm, and fields of wheat and turnips, and windmills, and church-spires, and white-washed cottages, with their little trim gardens, and waggons and

mail-coaches toiling or whirling along the dusty roads, can never rival ;—and long may they remain unchanged by the axe and the plough, to gladden the heart of the naturalist, the painter, and the tourist, who have escaped from the wretchedness of high civilization to enjoy the refreshing contemplation of rural scenery and rustic life.

In ascending the long and tortuous valleys which lead from these sea-lochs to the inland solitudes, we find the same trees. Thickets of hazel, tangled with brambles and briars, and woods of birch and oak, stretch along the declivities. The rivers and rills are fringed with alders and willows. The ash, the rowan, and the holly are seen springing up from the clefts of the rocks, and the poplar, with its tremulous leaves, glitters in the chasms through which the torrents have forced their noisy way. The trees, which are found highest upon the mountains, are the birch and the mountain-ash. The former of these trees is also that which extends furthest towards the central mountains, along the valleys ; but the alder and willow are found along the streams, where all other sylvan vegetation has ceased.

In these inland valleys, we often find enormous trunks of alders and birches, their branches fallen, rotten at the core, and covered with shaggy lichens, standing in the desert, as melancholy monuments of the old times, when even the central and elevated glens were covered with continuous forest. From these old trunks a profusion of diminutive twigs is still seen to shoot ; but no young trees spring up around them. Over extensive tracts, now utterly destitute of wood, and scantily clothed with heath and lichens, we find by the roots and portions of decayed trunks, that trees once grew in profusion, where there is not now the least tendency to produce even a solitary shrub.

Embosomed among the mountains, we often find extensive lakes, the shores of which are covered with sylvan verdure. Of this kind are Loch Maree, in Ross-shire, unrivalled in Scotland for its magnificent scenery, and Lochlagan, wild and secluded, winding among forests of birch, and overhung by desolate and dark mountains. The trees observed by me among the former of these lakes are the fir, the white birch, the oak, the rowan, the poplar and the alder ; and along the latter, the birch, the rowan, the oak, the hazel, the poplar, and the holly.

The scenery of Lochlomond, Loch Tay and Lochness is now familiar to every person who can afford the time and money necessary for a summer excursion. The woods along the latter of these lakes consist of birch, alder, hazel, oak, hawthorn and ash. A few fir trees are seen at the Fall of Foyers ; but farther back among the mountains, this tree is more common.

In the Highland districts, however, it is only along the sea-lochs and inland lakes, in the deep glens, and by the bases of the mountains, that trees occur. The mountains themselves, with all their long ranges and ramifications, the open moors, and many extensive tracts of high but comparatively level ground, are entirely destitute of wood.

A principal feature of Highland scenery had, at no remote period, been formed by the great masses of fir which stretched along the moors ; but at the present day these masses are in almost all the accessible places reduced to mere remnants. The great fir forest of Loch Maree has almost entirely disappeared ; the Strathglass woods have been greatly diminished, and, in general, the traveller hardly meets with a patch of indigenous fir in the course of a day's journey. It is in the central districts of the middle division of Scotland that this noble tree has found comparative exemption from the axe, and in the forests of Braemar and Glentanner, it may still be seen in all its pristine glory.

The southern division of Scotland, excepting along the shores of the Solway Firth, and the course of the eastern boundary, is much barer of trees than the other divisions. In Glenappe, near the mouth of Loch Ryan, where there is still a good deal of natural wood, the trees are the birch, the hazel, the ash, the alder, the hawthorn and the sloe ; and, in general, the trees in this division are the same as in the others, with the exception perhaps of the fir and wild apple, which I have nowhere seen.

If we descend from the Highland districts towards the eastern coast, following the course of the rivers, we find the same species along their shores down to the sea, the birch becoming less frequent, and the willows increasing in number. But the whole extent of the gentler slopes and low moors, and even the bases of the mountains and hills, are entirely bare. Here, however, where the soil has not been cultivated, the deficiency has

been supplied by artificial woods, which now render the aspect of the country very different from what it was in the days of Dr Johnson, of whose remarks on this subject we have heard so much.

In examining the places where our natural trees grow most abundantly and luxuriantly, one might be surprised to find that the soil is generally sterile and shallow. This, in fact, is almost universally the case. Excepting a few species of willow, the alder, and perhaps the bird-cherry, I do not know a single native tree that does not seem, by preference, to grow in sterile soil. We know, indeed, that the oak, the elm and the ash, attain a greater size, when planted in deep soil; and it might be said that the circumstance of our indigenous woods being generally upon barren ground, is no evidence of the predilection of trees for such ground, as they are merely the more stunted remnants of our ancient woods, which have escaped on account of their inaccessible situation. Yet the circumstance is an important one, and ought at least to prevent the planter from being discouraged by the sterility of a district. It is astonishing to see in numberless places, large ashes, rowan-trees and poplars springing up from the crevices of rocks, or from among gravel and fragments of stones, where they do not seem to have a particle of such soil as is generally considered essential to vegetable luxuriance. All our native firs grow in shallow and gravelly soil. Even the roots of primeval firs, so common in many of our peat-mosses and moors, generally occur in the gravelly or clayey subsoils; and in those parts of the country where portions of the original woods yet remain, we never find that the trees have sprung from the peat which now forms the surface soil, but from the subjacent strata of primeval formation. If this fact be correctly stated, it follows, that, with reference to certain species at least, such as the fir, the birch, the aspen and the mountain-ash, it would be well in planting, to immerse their roots in the original subsoil, and where the superincumbent peat is not too thick, to clear it away for that purpose.

It is difficult to account for the fact, that trees do not now propagate naturally in Scotland, in places which were formerly covered by them. The fact itself is certain. In the Hebrides, where several species still grow in the crevices of rocks, the

birch, for example, the hazel-leaved elm, the aspen and the rowan, these trees never propagate from seed, and merely send out a few shoots from the root. In many of the inland glens, where we meet with decayed forests of alder and birch, a few years will leave the heathy and fern-clad peat-soil utterly destitute of trees. Peat-soil is obviously unfavourable to the growth of trees; and it appears probable that its accumulation in these places is the principal cause which prevents the native seeds from germinating, or the young trees from rooting.

There is no evidence of any decided change of climate, and any influencing cause arising from such a change is merely conjectural. But from what we know of the past and present state of this and other countries, we may fairly attribute the chief cause of the defective propagation or disappearance of native wood to a change in the nature of the surface soil.

Thus the central parts of Ross-shire were covered with pine. This is proved, not merely by tradition, but by ocular evidence, the roots still remaining in the ground. These roots are all found, in their natural position, in gravel, or clay, or the crevices of rocks. This original soil is now covered to a varying depth with peat, which we know increases rapidly in favourable situations, and which always increases when covered by the vegetables which naturally grow upon it in this country. If it is daily increasing, it must have had a commencement. Fir seeds sprinkled on deep peat will not grow, or will not give rise to permanent trees. Therefore, when the seeds from which sprung the trees, whose decayed roots are now found in the subsoil, were naturally sprinkled and germinated, what is now subsoil was surface-soil, or was but very thinly covered by peat. Again, fir-trees grow perfectly well at the present day, when planted in gravelly or sandy soil, or in such soil slightly covered by peat. Therefore, the soil fitted for that tree, as shown by this circumstance, and the situation of old roots, is gravelly soil.

The same reasoning applies to many other trees, in so far as regards peat, although the soil in which they thrive best may be different. And thus it would appear that the chief cause of the extinction of our natural woods in the Highlands, is the accumulation of peat.

But another question presents itself, with respect to the islands

and maritime districts:—How does it happen that there, when trees have been planted, and have vegetated vigorously for some time, they are yet stopped short the moment they get beyond the level of the sheltering wall or rock? Trees, it will be said, formerly grew in such situations. Thus there is a large fir-root at the head of Loch Resort in Harris, washed by the high tides. But there is no evidence that, in such exposed situations along the shores, trees ever grew. With respect to the above root, it may be said that there are numerous submarine forests along the coast, for example, in Pabbay and Islay, where the roots retain their original erect position, although no one could imagine that they had ever grown in the sea. The inference therefore is, not that large trees formerly grew upon the exposed sea-shore; but that the roots now found there were those of trees formerly growing in inland situations, but which, by some geological revolution, became maritime by the submersion of the intermediate ground. The sea air is thus, after all, probably the cause which prevents the growth of trees on exposed parts of the coast. Trees planted in such places will grow, however, when sheltered by a screen of any kind, although they never thrive as in more inland parts. The violence of the westerly gales is also very injurious to them; and from both causes operating together, the hedges and shrubs about Ballintrae, on the Ayrshire coast, are miserably stunted, and all incline to the eastward. The predominating influence of the westerly winds is indeed felt in all parts of Scotland; and even in the neighbourhood of Edinburgh, all the tress that grow in open places have the same inclination.

The clearing of land for agricultural and particular purposes, is rendered necessary by the progress of civilization, which is fast extending her empire over the land. The great forests of all the lower districts have long ago vanished, and have been partly replaced by trees imported from the Continents of Europe and America. Even many of the Highland glens have been filled with these trees, and the few patches of natural wood left in the Lowlands have been so intermixed with planted trees, that one cannot separate the natural from the artificial in them. The time is perhaps not far distant when the remote districts will cease to produce an unmixed vegetation,

and when the botanist, wandering among their deep glens and by their secluded lakes, will see on the craggy cliffs the native products of the soil mingled with those of distant lands. But surely, no trees can be better adapted to the climate of Scotland than her own native trees; and it remains to be proved that the oak, the ash, the elm, the pine, the birch, and the mountain-ash, are not as valuable or as ornamental as many other trees which are made to supplant them.

ON WHEEL-CARRIAGES. *By WILLIAM GALBRAITH, Esq. M. A. Edinburgh.*

THE application of wheel-carriages to general purposes, and particularly to those of agriculture, forms an important object of discussion in every country where the useful arts are known and cultivated. The difficulty of moving or transporting heavy bodies on rugged and uneven surfaces, would early suggest the idea of sledges, which in certain circumstances are still advantageously employed. The friction attending these, however, would soon be felt, and would lead those frequently employing such machines, from the properties of sliding to those of rolling bodies, which are still less affected by friction. The rollers or wheels were originally attached to an axle, so as to revolve along with it, as at this day exemplified in the Irish cars. But a little experience and reflection would show that the friction would be less if the wheels were moveable about an axle, which itself remained fixed to the body of the carriage; and that this, besides diminishing friction, would likewise diminish the force requisite to move the carriage, by saving the power necessary to turn the axle which was formerly moveable, but would now be at rest.

A slight consideration of the subject will prove, that wheels, moveable about a fixed axle, have other advantages than this, such as those which arise from facility of turning in a narrow space, where one wheel is capable of moving forward, while the other may revolve backward. This evidently gives to wheels moveable about an axle, a decided advantage over those attached to it, as has been sanctioned by long experience. A

further advantage arising from this mode of fixing the wheels is, that] the construction] of the parts by which the axle is attached to the cart, is lighter, and less complicated, than by the other method.

Carriages have, in general, hitherto been moved by animals, and even sometimes by wind, but there is now a prospect of that powerful agent steam being applied to this purpose.

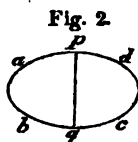
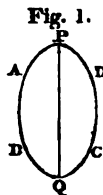
In discussing the subject of wheel-carriages, which is allowed to be attended with considerable difficulty, it is proposed to treat,

- I. Of the proper formation of the several parts of which the carriage is constructed.
- II. Of the agents generally employed as a moving power.
- III. Of the most advantageous methods of applying that power.

I. Of the proper formation of the several parts of which the carriage is constructed.

1. Wheel-carriages are generally divided into two kinds or classes—one having two wheels, and the other four, and both these have their peculiar advantages. For lighter purposes, those having two wheels are generally employed. They are more readily managed, quicker in their movements, and relatively perform a greater quantity of work with the same number of horses than the larger machines; while for the transportation of the more bulky and ponderous objects, those having four wheels are most convenient, and often absolutely necessary. The bodies of the carriages which are intended to contain the load supported upon the wheels, are, or ought to be, formed according to the species of loads they are likely to carry. When the loads are specifically light, the body should be large and full, so as to bring the centre of gravity as low as possible, to prevent the cart from overturning on an inclined road, when highly loaded with comparatively light materials, as hay, straw, and similar substances. For loads of great specific gravity in particular, that is, loads of considerable weight within a small bulk, the body of the carriage should be strong and compact, and every advantage taken of the materials of which

it is constructed, to render it sufficiently strong, with the least possible weight, by means of a proper arrangement of its parts to resist pressure without derangement or fracture. This can only be accomplished by possessing an accurate knowledge of the relative strains in different parts, and then applying the iron, wood, and other materials, in the best possible manner, founded upon scientific principles. In the common cart, for example, with two wheels, since the shafts must support generally the most considerable strain in a vertical direction, they should therefore be stronger that way than in a horizontal direction; or a section of each shaft somewhat rounded in an elliptical or parabolic shape, should be similar to $A B C D$, having its greatest diameter $P Q$ in a vertical position, as in Fig. 1., in place of having its shortest diameter $p q$ vertically, as in Fig. 2.



This is obvious from the well known property of beams demonstrated by Galileo, that their strength is proportional to the breadth multiplied by the *square* of the depth. Whence the relative strength of beams of the form represented, supposing the area of the section to be the same, is as the longer diameter to the shorter, or as $P Q$ to $p q$. This shows the great importance of giving every part not only its proper size, but also its true position. No doubt sometimes in turning a cart, there is an additional strain on the shafts in a horizontal direction $b c$, Fig. 2., though far from being sufficient to justify such a deviation from sound principles. This is indeed so obvious, and frequently followed by the best makers, that unless the contrary method were often adopted in some parts of the country, it would have been almost unnecessary to have pointed it out.

The various parts of the body of the cart or carriage should be supported by braces of wood or iron, not in the usual unscientific manner, at right angles to each other, but diagonally, as has been so happily done by Sir Robert Seppings in the construction of our vessels of war under the name of *diagonal bracing*; and as it appears unnecessary to enter into particulars here, little more need be done than merely to allude to a system so generally beneficial.

2. It may now be proper to consider the nature and properties of the axle, which ought to be properly and securely fixed to the body of the carriage, by bolts, hoops, or such other means as may seem most convenient. To give the wheel the best position for easy motion, and as little friction as possible, the general shape of the axle should be straight. Its arms should be rounded, slightly tapering, in the form of a frustum of a cone, and smallest at the extremities, that it may not wear loose; and at the same time that it may allow the wheel to be readily removed and replaced without being too tight, or having too much play, though sufficient to admit the usual compositions of tar, grease, &c., to lubricate the axle and diminish friction.

As every body is liable to bend by pressure, it is obvious that the axle, whether made of wood or iron, will be liable to flexure in a slight degree, in a vertical direction. Since the force of the power applied to move the carriage forward will be opposed by the friction of the wheels upon the irregularities of the road, there will also be a slight tendency of the axle to bend backwards at the extremities. These two flexures, however, from the nature and construction of the machine, must be very slight, and therefore a very small bend downwards and forwards given to the extremities of the axle, will be sufficient to counteract these effects, and render the lower surface of the arms of the axle nearly horizontal within the naves of the wheels.

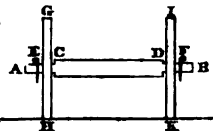
3. Great care should be taken not to give the axle at its entrance into the nave of the wheel too great a bend, as is sometimes customary, particularly in England. The bad effects of which are, to cause the wheels to be formed somewhat of the shape of the frustum of a cone, of which the vertex is at some distance from the carriage, nearly in the direction of the axle, whereby the wheel, instead of proceeding forward, naturally has a tendency to move round the imaginary vertex of the cone just alluded to, as a centre, revolving obliquely, producing an irregular and unfavourable action of the parts in contact, and increasing friction.

It is likely, indeed, that the axle in the rude machines of early ages was at first straight, but as improvements were intro-

duced, it would in time receive such modifications as the judgment or caprice of the constructor might suggest. Still, however, there seems to be no just objection to the axle being nearly straight, in order to ensure the best and easiest motion to the wheels, provided the part within the nave be truly cylindrical and of equal diameter throughout, though there may be some other advantages attending a deviation from this form, which will be afterwards examined. Thus A B, Fig. 3, would likely

Fig. 3.

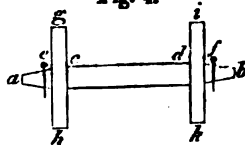
be among the more early modes of constructing the axle, having shoulders at C and D, and iron bars called *linch-pins* at E and F, to keep the wheels G H and I K (having their planes perpendicular to their axis, and rendering their motion of rotation by that means the easiest possible), steady in their proper position; the parts E C and D F, round which they revolve, being equal cylinders of the same diameter.



4. In this mode, however, it would be found from experience, that the wheels would with difficulty, or at least less easily, be removed and replaced, more especially before the invention of a machine for raising the wheel from the ground, as is now usual, at least for gentlemen's carriages. This would suggest the propriety of giving the axle a slight taper towards its axis at the extremities, in order to remove the inconvenience. At the same time the wheel may be prevented from becoming loose by wearing, by pressing the nave towards the shoulder, and tightening it by the linch-pin. The axle would then have the shape of *a b*, Fig. 4,

Fig. 4.

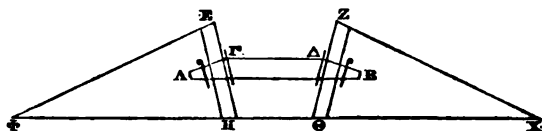
tapering all around regularly from *c* to *a*, and from *d* to *b*, and the planes of the wheels *gh*, *ik*, would still be at right angles to the axis, rendering their circular motion the most favourable for ease and simplicity. One bad property would result from this structure, namely, a tendency of the wheels to slide off at the end of each axle, thus producing a considerable pressure on the linch-pins, at *e* and *f*, which would be both inconvenient and injurious, from the severe friction of the bushes in the naves against them. The upper parts of the wheels would, in both the preceding methods,



be liable to rub or chafe the carriage, or the load when it projected over the sides of the cart; while in wet weather the mud carried up by them would partly be thrown into the cart, and would partly fall upon the axle and nave, and work in between the axle and bush, causing a considerable wear in both in a short time.

5. To obviate these inconveniences, it would next be requisite to render the lower surface of the tapering and working part of the axle called the arm perfectly, or at least nearly, horizontal, so that the pressure on it should have no tendency to force off the wheel, and make it press unnecessarily on the linch-pins, while the upper parts of the wheels by this means would be thrown outwards from the load, and would move quite free of it. Indeed, it seems to be sanctioned by experience, that the axle should be slightly bent at the shoulder, in order to give the wheel a tendency to press upon the axle rather than on the linch-pin. By this we get free of one or two difficulties, though others of a different kind are introduced.

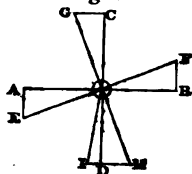
Fig. 5.



Let AB , Fig. 5, be the axle, having its under side nearly a straight line, the extremities FA , ΔB , tapering within the naves; then the planes of the wheels become oblique to the horizon: the exterior surface of the felloes must be bevelled so as to become a small frustum of a cone, the vertices of which are about ϕ and X , thus introducing oblique action in motion, and an unfavourable position of the spokes of the wheels, with regard to strength, since they must be strongest when perpendicular to the level plane $\phi H \Theta X$. This last evil may be corrected by *dishing* the wheels, as it is called, while the oblique motion of the wheels arising from their necessarily conical shape, produces less injury in ordinary circumstances than that derived from the pressure of the nave against the linch-pins in equally tapering axles, as in Fig. 4.

6. Hence, if the under surface of the axle be straight, the quantity or amount of the dishing ought to depend upon the angle of taper of the axle, the one being exactly equal to the other. For let AB, Fig. 6, be a horizontal line, and CD a vertical line at right angles to it. Also, let EF be a part of the axis, or central line of the tapering axle, and GH a perpendicular to it, passing through O as before. Then the angles AOD, EOH are right angles.

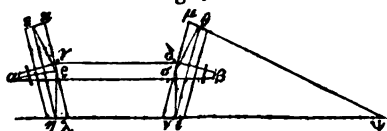
Fig. 6.



From each take away the common angle EOD, and there remains the angle AOE equal to DOH; that is, to bring the under part OH of the oblique wheel GH into the vertical position OD, it must decline from the plane of the oblique wheel GH at an angle of *dishing* HOD, equal to AOE, which the oblique central line of the axle makes with the horizontal line AB. If this principle be attended to, the spokes will, on a road nearly level, be truly vertical, or in the strongest position, as in this situation they ought to be.

7. In the case of iron axles, the taper is in general small, and perhaps would not, in many cases, be sufficient for the required quantity of dishing, which should be about one-twelfth of the diameter of the wheel; whence this easy practical rule,—the diameter of the wheel in feet gives the dishing in inches. Then a moderate bend in the axle will be requisite to bring them nearly to an equality, though the dishing should be properly a little more, not exceeding an inch or two, taking the direction OI; so that, when the carriage is inclined in a small degree, the under spokes are truly vertical. On these principles, let $\alpha\zeta$, Fig. 7, be the central line or axis of the cylindrical portion of the axle within the naves, to which $\alpha\lambda$ is perpendicular, similarly to EH, Fig. 5., and $\zeta\eta$ perpendicular to the under surface of the axle, then, as has just been demonstrated in last article, Fig. 6., it is obvious, that the angle $\eta\lambda$ is equal to the inclination of $\alpha\zeta$ to the sole of the axle. The taper consequently ought to regulate the amount of the dishing

Fig. 7.



when properly executed, so that the spokes, in ordinary circumstances, may be nearly perpendicular to the plane of the road. Whence ϵ and θ give the dished shape of the wheels; and, to make the dishing moderate, the taper of the extremities of the axle, combined with the bend, should not, taken together, be great.

8. Hence also the stability of the carriage is not injured by this mode of dishing, because the centre of gravity is in as favourable a situation as if the wheels were actually vertical, since the spokes in the under part of the wheels are nearly vertical, however different the distance between the felloes of the wheels may be at top and bottom, while the greater distance at the top gives additional room for both carriage and load. In fact, it is to the want of a proper attention to the nature and true properties of the axle, that most, if not all, the faults said to attend well constructed dished wheels may be attributed.

Undoubtedly the oblique action of conical wheels is unfavourable for easy motion; but, if the spokes in the under side of the wheels be at right angles to the truly horizontal under surface of the axle within the nave, the easy motion of the wheel would not be much injured by such a shape, if it were possible that the exterior surface of the iron-hoop could touch the road at the lower point only. Now as this, though not perfectly true in bad roads, is nearly so in good ones, there seems to be little cause for the vituperation of dished wheels properly made, which has been generally cast upon them by many popular writers, who have not investigated their properties upon scientific principles.

Indeed they offer several advantages which the other wheels do not, and a careful consideration of their properties can alone show their qualities. Any custom very generally adopted, frequently results from some valid reason of the inventor, which is often lost sight of by his successors, who continue, as they think, to follow the original plan, sometimes with improvements; but having become ignorant of the motives and principles of the first constructors which should have guided them, they fall frequently into extremes, which are really injurious.

In addition to the taper of the axle, a considerable bend, much more than is requisite for the purposes already pointed

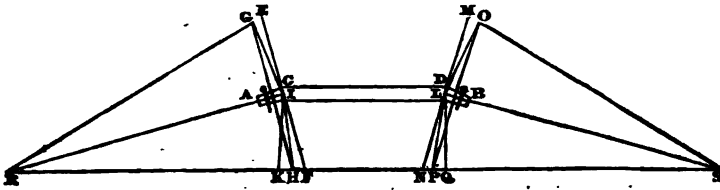
out, and consequently injudicious, is often given to it at the shoulder where it enters the nave, thus producing a very injurious action in the wheel, placing the spokes, or rather the plane of the spokes, too much in an inclined position towards each other at the bottom, unfavourable to strength, and diminishing the stability when the carriage is inclined on a bad road. All these ought to be particularly guarded against, although perhaps a slight degree of dishing more than the taper of the axle, depending on the amount of bend, may be given, especially when the wheels are narrow, as a slight inclination of the spokes *outwards* appears to be of use in keeping them more steady on their axles, than if they were exactly vertical. By an inclination of the carriage, too, a greater proportion of the weight of the load is thrown on the lower wheel, and then its spokes, being in a vertical position, are able to exert all their strength with advantage.

The dished form will be found on experience to render the wheels more lasting, because from their slightly conical shape, the effect of the felloes, supported by the iron-hoop, tends to bind them together, and prevents the spokes from working loose in the mortises of the naves. But when the spokes, as sometimes recommended, are at right angles to the axis, this property is lost, and the spokes are then chiefly prevented from working in the direction of the axis, by the support of the nave only, and in time acquire a slight dishing in the opposite direction, or toward the cart, at the same time the tops of the wheels become closer than the bottom, which makes them look very unseemly. In some wheels each alternate spoke is made to have a different inclination, producing by that means greater stiffness and mutual support, by bearing against each other, and acting as braces in the direction of the axis, than when they have all the same degree of dishing*.

9. Many of these defects may be seen in the large and cumbersome English waggons, the most unprofitable machines of the kind perhaps that can well be conceived.

* It has been thought necessary to explain this method of constructing wheels, and assign the reasons, as Dr Brewster in his valuable additions to Ferguson's *Mechanics*, page 214, vol. ii., note, seems to experience a difficulty in discovering them.

Fig. 8.



Let RS, Fig. 8, be the horizontal line on which the wheels GIH, OLP move, of a proper dished form; but, in addition to this, the axle AILB has a considerable bend at the shoulders C, D, causing the central lines or axes of the axle to take the directions IR, LS, thus throwing the under part of the wheels from the true vertical position *inwards*, when in fact it should rather be *outwards*; so that the part under the axle, instead of being nearly perpendicular to the level road as IK, LQ, takes the position IH, LP. Without the dishing they would have been much worse, assuming the directions EF, MN, which are much more unfavourable to a free action; and, on an inclined road, the carriage or waggon is more liable to be overturned by the line of direction of the centre of gravity falling more readily without the base of the wheels. An advantage arises from the dished form throwing out the upper part of the wheel likewise. Since it projects outward from the carriage, any mud, sand, &c. in wet weather, that may be carried up by the rotation of the wheel, falls outwards instead of being thrown upon the carriage, or descending upon the axle at C, and then working into the nave between the bushes and axle, thereby causing a rapid wear of both, as has been already observed.

10. Another bad property results from the bends of the axle, when carried to excess in these heavy waggons, which must have large and broad wheels. The exterior surfaces of the felloes in these are not in the same plane, but somewhat rounded, and generally protected, not by one single hoop of iron, but by three, or more, as in Figs. 9. and 10., having a greater or less inclination to each other.

Thus, in Fig. 9., the spoke below the axle, having its under surface level, and the wheel properly dished on our plan, takes

Fig. 9.

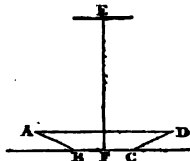
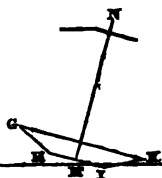


Fig. 10.



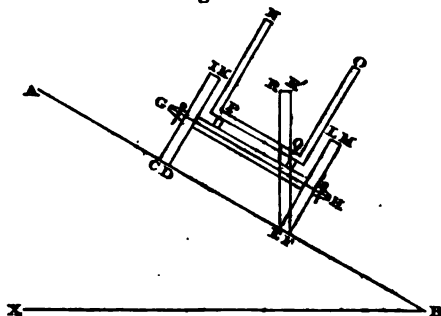
the nearly vertical position EF, to which the middle hoop BC is perpendicular, while the other two AB, CD, are somewhat inclined; but, upon the whole, they are fairly placed, so far as regards that mode of protecting broad wheels. On considering Fig. 10., however, it will be seen that the bend in the axle at the shoulder N, as above, or at L, Fig. 8., when too great, makes the under spokes, LP, represented by NM, Fig. 10., oblique to the road; and consequently all the protecting iron-hoops or rings are so too, which, in addition to a bad motion, adds that of cutting up the roads more severely than in the former case, as has been sometimes pointed out in strong, though perhaps just, language.

11. The next property to be considered is the stability of wheel carriages, or their tendency to resist oversetting when on an inclined road, and moving at a considerable velocity. This depends upon the position of the centre of gravity of the carriage and load together. The lower it is, so much the more stable will the carriage be. A proper proportion between the height and breadth regulates this point. When carriages are narrow and high, the centre of gravity rises; and, on the contrary, when they are broad and low, under the same capacity, it descends; and a just proportion between these serves to assign its true and safe position, so as to fall within the wheels, even when the carriage is moderately inclined. It is obvious, then, that it depends in part on the proper position of the under part of the wheels, when the distance of their centres is given. By increasing the distance between the felloes at the bottom, the stability may be increased; and, by diminishing it, the stability will be lessened. But it is clear that a certain latitude only can be given to this variation of the inclination of the planes of the wheels, otherwise their strength and efficiency will be injured, as has been already pointed out, when treating of the proper form of the wheels, and the most advantageous de-

gree of dishing that should be given to them. This, from our investigations, appears to be that proposed when describing Fig. 7. § 7.; and we shall now endeavour to place the different varieties in one point of view, so that the relative properties with regard to stability also may become known.

Let Fig. 11. be a carriage supported on wheels, of which the

Fig. 11.



spokes are perpendicular to the axis of the nave, as in Figs. 3 and 4., formerly given, and moving on the inclined plane AB. Fig. 12. also corresponding to Fig. 7., and Fig. 13. to Fig. 5. or

Fig. 12.

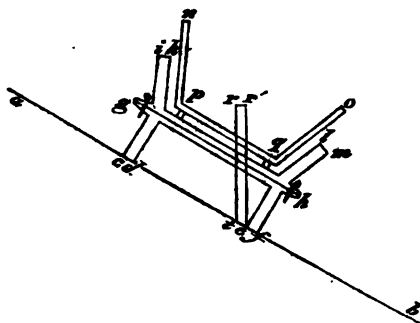


Fig. 13.

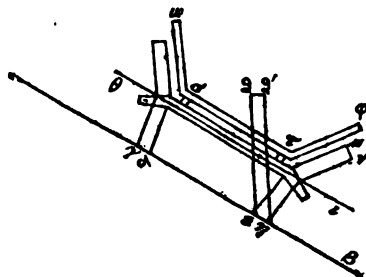


Fig. 8., already explained, and moving on planes ab , cd , equally inclined to the horizontal or level line as AB to BX , Fig. 11.

Also let the points marking the centres of gravity of these carriages be respectively R , r , e , of which R is the highest above the road, from the smaller breadth of the body of the cart $NPQO$, which, from the shape of the wheels, cannot be wider at NO than at PQ . It is clear, from Fig. 11., that when the carriage is at rest, or moving straight forward, it is just stable, though very little more inclination would upset it, either by the wheel DI moving over any slightly higher obstacle, or by the wheel EM falling into a hollow.

On account of the greater breadth at the top of the cart $npqo$, Fig. 12., than that of $NPQO$, Fig. 11., the centre of gravity falls lower than R , and consequently the vertical line rt , passing through the centre of gravity r , falls nearer the middle between the wheels than RE . By reason of the bend in the axle of the cart, Fig. 13., which is, in this instance, too great, the soles of the wheels approach each other much more closely than either of the other two; and the vertical line et , passing through the centre of gravity e , falls nearly upon the bottom of the wheel, though, on account of the shape of the body of the cart, it is lower than either of the other two. Upon the whole, then, the construction of the cart or waggon, Fig. 12., with properly dished wheels on the plan formerly proposed, has still the advantage.

In addition to these, other means have been resorted to for the purpose of keeping the centre of gravity down. One of them consists in having the luggage placed as low as possible in travelling coaches, by carrying it in a box slung under the carriage, so as just to clear the road sufficiently. Such are the plans of some of our best coachmakers, and agricultural implement makers.

11. It has as yet been supposed that the carriages were either at rest, or moving forward in a straight line. It frequently happens, however, that, in the old roads in particular, a rapid turn, or quick bend, is met with in the road, where the carriage must turn smartly, producing what is called a centrifugal force, which has a tendency to throw the carriage over in the opposite direction, or towards the convex side of the turn. The amount of this force depends upon the radius of the curve in the road,

combined with the velocity, which, in the case of the mail coaches, and travelling carriages, may sometimes be considerable. If this concur to augment the danger from the inclination of the road and a badly constructed carriage, on entering a bridge, or approaching a precipice in particular, the consequences may be fatal. Indeed, it is generally under these circumstances that the greatest accidents happen; whence a due attention to the proper formation of our roads is as indispensable for the safety of travellers, as an eligible construction of our carriages.

To illustrate this to persons not very conversant with mathematical and philosophical inquiries, a few results, stated in a table, with conclusions drawn from them, will, it is hoped, be sufficient.

The formulæ for obtaining the amount of centrifugal force are,

$$F = \frac{v^2}{r} \dots \dots \dots (1)$$

which gives the effects in feet, supposing the force of gravity, generally denoted by g , to be 32 feet; v the velocity of the moving body, or the number of feet which it passes over in one second of time; r the radius of the circle in which the body is moving, which, in this case, is the radius of the curve in the road; and F the centrifugal force.

If the centrifugal force be required in terms of the weight of the moving body, then

$$f = \frac{v^2}{gr} = \frac{v^2}{32r} \dots \dots \dots (2)$$

f being the value of the force, v the velocity, and r the radius of curvature, as before. Suppose the radius, or r , to be 100 feet, which is not an uncommon case, then will the following table, drawn up for the purpose, give the effects to different velocities.

Velocity in English Miles per Hour.	Velocity in Feet in One Second.	F in Feet.	f in parts of the Weight.
5	7.3	0.54	0.017
10	14.6	2.15	0.070
15	22.0	4.84	0.151
20	29.3	8.60	0.270
40	58.6	34.42	1.080
60	88.0	77.44	2.420
100	146.6	215.11	6.722

From an examination of the formulae, it is evident that the centrifugal forces vary inversely as the radius of curvature, the velocity being the same: that is, as the radius of the curvature or bend in the road *increases*, the centrifugal force *decreases*; and, on the contrary, when the radius of the turn decreases, the centrifugal force increases. Therefore, as any other assumed radius is to 100 feet, that adopted in computing the foregoing table, so is the centrifugal force stated in the table to that for the radius required. Hence the effects of centrifugal force may, by this means, be estimated for any other curvature wanted. Thus, let the radius be 50 feet, one-half of 100, and F and f will be doubled, &c.

From the principles of centrifugal forces, the centre of gravity is virtually thrown aside from B , Fig. 11, where it would be if the carriage were at rest, or moving forward in a straight line to R' ; so that, when the velocity is about ten English miles an hour, the rate of our ordinary mail coaches, and the radius of curvature 100 feet, if the vertical line RE , passing through the centre of gravity R , were 52 feet in length, then RR' would be by the table 2 feet nearly; that is, RR' is $\frac{1}{18}$ th of RE , or of the height of the centre of gravity above the road nearer the wheel EM , if the carriage turn rapidly at the rate of ten miles an hour, or $14\frac{1}{2}$ feet in a second of time round A as a centre, at the distance AE of 100 feet. It would be twice $\frac{1}{18}$ th, or $\frac{1}{9}$ th, if AE were 50 feet, which is not an uncommon case. In ordinary circumstances, the centre of gravity is less than 4 feet above the road, and therefore it might generally be about $\frac{1}{3}$ th of 4 feet, or $\frac{4}{3}$ foot thrown aside from E to F , which would render the carriage, on such an inclined plane, just ready to overset. Should greater velocities be attainable, as is likely, even to a considerable amount, by means of improved roads, and the employment of steam-carriages, analogous consequences may be deduced from the table, p. 529, for the several velocities there stated. At twenty miles an hour, the centrifugal force, compared with gravity, is, from column 3d, 9 feet nearly, or $\frac{9}{4}$ of the height of the centre of gravity, or say, for the sake of simplicity, one-third of that height; so that, if the centre of gravity be 4 feet above the plane of the road, as formerly supposed, it would in effect be thrown aside by this means, nearly $\frac{1}{3}$ of 4, or $\frac{4}{3}$ foot, equal to $1\frac{1}{3}$

foot, or 1 foot 4 inches. Supposing the distance between the bottoms of the wheels to be 5 feet, then this effect of centrifugal force would be the same as if the carriage were moving on an inclined plane having a rise of 1 foot 4 inches in 5 feet, or at an angle of 15° . In like manner, the investigation might be carried to higher velocities; but enough, it appears, has been said to prove the danger of high velocities at rapid turns or curves in a road. Two or three consequences naturally flow from this reasoning, such as the necessity of drivers reducing the velocity at such places, particularly if there is also an inclination of the road: Road-trustees, too, should endeavour to improve the road there, by removing the turns, or giving them a greater radius; and the best shape should also be given to the wheels and carriage, to ensure stability by keeping the centre of gravity as low as possible, and rendering the under parts of the wheels as distant from each other as is consistent with convenience.

To show this still more clearly, it may, by the table, p. 529, be placed in a different point of view, by employing column 4th in place of column 3d, as in the preceding cases. Instead of estimating the effect of centrifugal force in feet, it may be estimated in parts of the weight of the whole carriage and load. Thus, if the velocity be ten miles an hour, then the centrifugal force would be 0.07 or $\frac{7}{100}$ of the whole weight of the carriage and load, if the radius of curvature were 100 feet, and it would be double that or 0.14 of the weight, if the radius were 50 feet. Now, supposing the whole weight of the carriage and load to be two tons, then $2 \times 0.07 = 0.14$ or $\frac{14}{100} = \frac{1}{7}$ nearly of a ton, or about 320 lb.; that is, a force of about 300 lb. weight applied to the centre of gravity, would just equal the effects of centrifugal force when the radius of curvature is 100 feet, or it would be double this or 600 lb. if the radius be 50 feet.

Such a degree of minuteness to this subject has been thought necessary, both on account of its having been seldom or never discussed with any degree of attention, and on account of the bad form or curves in many parts of the roads on which there is much passage, and also in order to induce those engaged in improving the old, and selecting the proper lines of new roads, to avoid such situations and circumstances as may lead to these errors; and, finally, to show those constructing carts and car-

riages the necessity of a proper form and just arrangement of the carriage with regard to height, and the shape of the axle and wheels, so as to ensure every advantage that can possibly, by these means, be obtained.

On account of the good shape of the wheels, axle, and body of the carriage in Fig. 12, it is clear it would be just stable, since rr' would be less than RR' , on account of the centre of gravity being lower than that of Fig. 11, which is just ready to overset. Consequently $r'e$, the vertical passing through the centre of gravity, would be just within the wheels, and the carriage would possess some degree of stability; while ϵ_1 , (Fig. 13), the vertical passing through its centre of gravity, just meets the outer side of the wheel, though the centre of gravity ϵ itself, from the capacity of the carriage, derived from its peculiar shape, is the lowest of all the three forms, and therefore most favourable for stability. But the evil in this last case arises from the bad shape of the axle, which is considerably bent at the shoulder, and brings the bottoms of the wheels too close; therefore the centrifugal force throws the centre of gravity into the vertical line ϵ'_1 without the base, and overturns the carriage as easily as that shown by Fig. 11.

13. The proper size of the wheels is also a very important object in a well-constructed carriage. They ought not to be made too high, otherwise the horse draws disadvantageously, nor too low, since the friction would then be greater than necessary or expedient. Many vehicles are at the present time very improperly carried on remarkably small wheels, which causes great additional exhaustion to the horse, from the effects of friction, unless the roads be very smooth and well made. It is perhaps difficult to say what ought, in every case, to be the precise height of the wheels. It may generally be remarked, that they may vary between $3\frac{1}{2}$ feet and $5\frac{1}{2}$ feet in diameter, but cannot properly fall short of the one, nor exceed the other, without disadvantage. The fore-wheels in four-wheeled carriages are, in general, smaller than those behind, for the purpose of turning more easily, and giving a better position to the line of draught, which, in a subsequent part of this paper, will be further considered, otherwise they would be better if they were all of the same size.

14. A great deal has been written on the relative qualities of wheels which have broad or narrow felloes, and opinions are generally given in favour of the former. The reasons assigned are, that the narrow wheels have a tendency to cut up and materially injure the roads; whereas, on the contrary, the broad wheels, acting like a roller, smooth down, consolidate, and harden them. This, as a general principle, is undoubtedly true; but the question still remains, What is the most advantageous breadth? It is not very easy to answer this question satisfactorily. By giving a considerable breadth to the wheels, they no doubt act as a roller, and are advantageous to the roads; but, at the same time, they become heavier by the additional wood and iron, supposing the hoops nearly of the same thickness, and they cannot well be reduced in thickness inversely as their breadth, otherwise they would be too thin to afford proper support to the felloes, and would require a frequent changing of the iron, which would be both troublesome and expensive. This would, in some degree, counterbalance the advantage to the roads, by the disadvantage of trouble, expense, and the additional load upon the cattle employed as a moving power. The difficulty appears, then, to be to combine the greatest advantage with the least disadvantage, and this will be accomplished by making them neither extravagantly broad nor too narrow, according to the size and nature of the cart or carriage, and the roads on which it will generally be employed. From $2\frac{1}{2}$ to 5 inches may be the limits within which they ought to be kept, except in extraordinary cases.

We now proceed to the second section proposed.

II. Of the agents generally employed as a moving power.

1. The agents generally employed to move wheel-carriages are animals; and, in this country, chiefly the horse. The powers and capacity of the horse for this purpose are so well known, that it appears almost unnecessary to point them out. The power of a horse, or the exertion he is capable of making, according to different writers on this subject, differs in some degree from one another.

A horse, when treading in a mill-path, at the rate of $2\frac{1}{2}$ miles an hour, will, on an average, raise about 150 lb. by a cord hanging or passing over a pulley capable of easy motion, which is equi-

valent to 33,000 lb. 1 foot high in a minute. This serves as a scale to measure the effective exertion of a horse, and is generally denominated a horse-power. Messrs Boulton and Watt adopt a result somewhat less, or 32,000 lb., in estimating the effect of their steam-engines, and Tredgold only 27,500. In different varieties of the horse, the power is doubtless different, and perhaps 30,000 lb. may be a fair approximate value, in round numbers; and, when compared with the strength of a man, the effect of a horse will be, in ordinary circumstances, nearly equivalent to that of five or six men.

A horse generally works with advantage about eight hours a-day only, while a man commonly can work, without injury, at least ten. The action of a horse is indeed greatly reduced by the length of time during which he works, though the rate of decrease is not perhaps well known. Writers on this subject have advanced different hypotheses, and given formulæ to ascertain the effects under various circumstances of load and velocity, and some of them are at least tolerably good, by affording approximations somewhat useful. Thus, according to Euler, if f be the force which an animal exerts, measured by the weight with which it is actually loaded, in the manner just mentioned, F the utmost effort which the animal can exert, or the resistance which, at a dead pull, it is just able to overcome, v the velocity with which the same animal is moving with a given load, V the velocity with which the power of drawing or carrying a load entirely ceases, then

$$f = F \left(1 - \frac{v}{V}\right)^2 \dots\dots\dots (A)$$

This formula, originally proposed by Euler, from theoretical considerations, has been shown by M. Schulze to be pretty near the truth, by direct experiments.

The effect of animal strength, or quantity of work done in a given time, will be proportional to $f \times v$, or as the product of the force employed multiplied by the velocity of the animal's motion. It is also measured by E , the effect, which will be

$$E = Fv \left(1 - \frac{v}{V}\right)^2 \dots\dots\dots (B)$$

This, by the principles of the differential calculus, becomes a maximum when $v = \frac{V}{3}$, and $f = \frac{4}{9}F$; that is, the effect will be greatest when the animal moves with one-third of the speed

with which, at its greatest velocity, it is only able to move itself, without carrying any load, and at the same time is loaded with four-ninths of the load it is capable of moving. It also appears that the greatest effect produced will be represented by the product of the two last, or

$$f \times v = \frac{4}{27} \times F \times V \dots\dots\dots (C);$$

that is, multiply the greatest weight which a horse can move at a *dead pull*, by the greatest velocity with which he can travel without being able to move any weight, then $\frac{4}{27}$ ths of this product will be the greatest effect; or the product of the weight which he ought to exert to move a load, and the velocity at which he ought to travel. There is considerable difficulty in estimating correctly the values of F and V . Euler supposed, from his own experience, which has in some degree been confirmed by Schulze, that F might be taken, for men, at about 72 lb. and V at 6 feet per second, which reduces formula (A) to

$$f = 72 \left(1 - \frac{v}{6}\right)^2 = 2(6-v)^2 \dots\dots\dots (a)$$

Thus, when standing still, he can pull with a force of 72 lb., but if he walk at the rate of two miles an hour, he will be able to exert a force of traction of 19 lb. only; if at three miles an hour, it will amount to 5 lb.; and, at four miles an hour, or about 6 feet per second, he will be able to exert no force, but be enabled to carry himself forward only, which is pretty conformable to our experience, four miles an hour being the quickest rate at which a man in general, for some length of time, can travel, without exerting any force in pulling.

If v be assumed at a certain number of miles an hour, in this case,

$$f = 72 \left(1 - \frac{v}{4}\right)^2 = \frac{9}{2}(4-v)^2 \dots\dots\dots (a')$$

a formula which will give the value of f in lb when v is taken in miles.

Thus let $v = 2$ miles, then $f = 18$ lb. Again, let $v = 3$ miles, and $f = 4\frac{1}{2}$ lb., agreeing very nearly with those stated above, derived strictly from Euler.

(To be continued.)

ESSAYS ON THE ORIGIN AND NATURAL HISTORY OF DOMESTIC ANIMALS. By JAMES WILSON, Esq. F.R.S.E. M.W.S. &c.

ESSAY IV.

ON THE ORIGIN AND NATURAL HISTORY OF THE SHEEP AND GOAT.

(Continued from page 376.)

DOMESTIC RACES.

THE *natural* history of sheep, or such particulars as relate to these animals in their unreclaimed condition, was discussed in the preceding Number of this Journal. We shall now proceed to consider the history and characteristic properties of the more remarkable of the domestic breeds.

The milk of sheep yields but little cream, and produces butter of a quality greatly inferior to that of the cow; but it has been remarked, that the same measure of ewe's milk will yield double the quantity of curd which cow's milk affords. The milk of sheep is thicker than that of cows. Its taste is strong, and not very agreeable. The cheese made from it is rich, and, though of a peculiar flavour, is by many highly esteemed. The skins of these animals are in great demand by bookbinders and saddlers; and those essential parts of stringed musical instruments, commonly called catgut, are manufactured from their intestines.

In this country, seldom more than two are produced at a birth, more frequently only one. But, in the Netherlands, there is a large breed which produces three, four, and occasionally even five young at a time. Sheep rarely survive beyond their fourteenth or fifteenth year.

THE LONG-LEGGED SHEEP OF AFRICA.

Ovis aries guinensis, LINN. GMEL. *Ovis aries longipes*, DESM. *Ovis guinensis seu angolensis*, MARCGRAVE. *Belier et brebis des Indes*, BUFFON. *Le Moroccan*, EJD. *Suppl.* *Mouton à longues jambes*, F. CUVIER.

Of this variety the chaffron is arched, the ears pendant, the neck short, and the legs remarkably long. The body is covered with hair, which, on the nape of the neck and shoulders, as-

sumes the appearance of a heavy mane hanging down to the breast. There are portions of wool on the croup, back, and flanks. The tail reaches to the heels. The horns are generally short, forming not quite an entire circle round the ears. The skin of the throat is frequently pendant, and the colour varies from white to brown, black, and pied. Its length is $4\frac{1}{2}$ feet, and its height above 3 feet at the shoulders.

This is probably the largest and the tallest of all the domestic breeds. It resembles the wild musmon in the outline of its countenance, and its general deficiency of wool. It appears to have been first introduced into Europe by the Dutch, who naturalized it in East Friesland. Crossed with the common breed, it has produced the *Mouton flandrin* or Texel sheep (of which the wool, with a certain degree of fineness, is of great length), remarkable for always producing several lambs every year. Though ascribed by Buffon to India, its true country is Africa, more particularly the coast of Guinea. A specimen from Fezzan was sent to M. F. Cuvier by the French Consul at Tunis.

Several subordinate varieties may be referred to this race,—such as the *Morocco breed* with long wool, the hair on the neck short, undulating, and of a rufous-brown colour, the ears small and horizontal, the horns small, turning spirally outwards, the scrotum forming two separate sacks, and the general colour white, marked with liver-coloured brown*: also the *Congo breed*, of which the proportions are similar to those from Guinea, but with hollower flanks, and the chaffron greatly arched; they are meagre and powerless, and, instead of wool, are covered with loose hair, slightly lengthened beneath the throat; the horns are short, turned back upon the neck; the ears are pendulous; the throat wattled or pouched, and the tail very long, slender, and almost naked. The general colours of the fur are composed of large clouds of rufous coloured brown upon a white ground: The females are hornless.

The *Angola breed* are better proportioned. The chaffron is scarcely arched, the horns are small, and the wool, at least on those called *Coquos*, finer and more abundant: the others are

* A specimen of this kind was formerly in the possession of Sir Joseph Banks.

rather hairy. In all the tail is very long, the ears only horizontal, and the prevailing colour white, with broad rufous spots. Of the Angola race, one of the most remarkable is the *Zuma* or goitred breed, which is low on its legs, the hairs close, the ears pendulous, and the tail reaching to the fetlocks. It is very delicate, and has a singular mass of fat, in the form of a high collar, behind the horns, and resting on the occiput. The horns are short, slender, and turned inwards towards the forehead. Upon the larynx another mass of fat hangs like a goitre, under the throat, and the forehead is so prominent, that a deep depression occurs between the eyes. The ears, neck, body, and superior part of the tail are pale brown; the head, goitre, throat, legs, belly, and inferior half of the tail, white*.

THE BROAD-TAILED SHEEP.

(*Ovis aries laticauda*, Gmel. Desm. *Brebis à large queue*, Brisson. *Mouton de Barbarie*, Mouton d'Arabie, Buffon. *Ovis aries steatopyga*? Pallas.)

Several varieties from different countries fall under this designation, which, while they agree in the character of the tail, differ from each other in some other particulars. They are generally of a medium size, the chaffron arched, the ears pendant, but mobile, the wool coarse and long, and hanging in thick patches. The horns are large, directed backwards, then downwards and forwards; they are sometimes quadruple, and sometimes entirely wanting. The tail is greatly enlarged laterally in consequence of an enormous accumulation of fat in the cellular tissue; it is naked and flesh-coloured beneath, and its interior surface is marked by a slight longitudinal furrow.

The Hottentot broad-tailed sheep is characteristic of Southern Africa, although it now occurs also in Madras and Bengal†. It is of small size, handsomely made; the tail, the end of which is turned up and sharp pointed, is furnished beneath with a con-

* This remarkable variety is figured in the English translation of the "*Regne Animal*," vol. iv. p. 327.

† In Bengal there is a set of people called *Sheep-eaters*, who seize the animal alive, and devour it on the spot, wool, skin and entrails, as well as flesh. My friend Captain Smollett has been an eye-witness to this disgusting spectacle, which is likewise recorded in Forbes's *Oriental Memoirs*. It affords a fine example of eastern abstinence, and humanity to the brute creation.

siderable expanse of fat, which is rather thick than laterally spread; the wool is replaced by short soft white hair, and the tips of the ears, the knees, houghs, fetlocks, and a spot around each eye, are fulvous. This is a delicate variety, almost entirely useless as sea-stock, as it usually perishes during the first gale of wind. It is one of a vast race, which, according to Major Smith, is spread, with various modifications, over Egypt, Barbary, the Levant, India, China, and Russia.

There is another African race, not uncommon in Barbary, and sometimes found even in the Island of Corsica, which has three or four horns, pendulous ears, and the tail not very broad. The general colour is white, the posterior parts being covered with wool, and the head and shoulders with loose soft hair. A breed of this kind crossed with the Emmemas or Guinea sheep, was in the possession of Mr Wilding. Its entire covering consisted of soft silky hair, of a silvery whiteness. The hair of the fore and hind part of the neck was of great length, and there was a black spot on each knee and thigh. So forcibly was this animal acted upon by the colder climate of England, that in the month of November it began to assume the soft woolly coat of our native breeds.

The *Astracan breed* is remarkable in its youth, for the beauty of its fine frizzled coat, frequently used in the natural state as furs. These are taken from the lambs, of which the mothers are slain a few days previous to yeaning. The adults are covered with longer and coarser wool, beneath which the black and white coating of the young may be detected, but not in the frizzled state.

In northern and middle Asia, another broad-tailed breed occurs, remarkable for having four, five, and even six horns. The ears point forwards and downwards, the throat is wattled, the chaffron convex, and the wool coarse. This breed is found along the banks of the Wolga and Jennissai, and forms the flocks of the Kirguise.

The *Fat-rumped Sheep* described by Pallas, may be mentioned under the present head, although they perhaps belong to another and peculiar race. The caudal vertebræ are very few, and on each side of the tail there is a large rounded mass of fat, separated beneath, but united at the tail itself. It is cha-

racteristic of the Steppes of the south of Russia, but also occurs in Persia and China*. The wool is coarse, frequently dark coloured, or nearly black; the hoofs are long, and the ears pendulous.

The *Fat-rumped Sheep of Tartary* has long pendulous ears, and a very short tail. The quality of the wool is good, but the colour is mixed; that of the male being roan, or light-brown, mingled with white; of the female black and white. This is probably the species figured by Bewick, although he states, that, instead of a tail, it had merely a large protuberance of fat behind, covering the rump†. They appear to have either no horns at all, or very small ones.

A variety of the above breed, seemingly crossed with that of Astracan, is found in the Mysore. "It is hornless, with narrow pendulous ears; a very short clean tail, and the wool, very fine, is particularly curled, in small meshes, shaped like a corkscrew; the eyes are blue, and the colour pure white. It is the most beautiful breed of India. The late Sir Joseph Banks had a specimen which came from the Gardens of Tippoo Sultan, at Seringapatam‡."

THE LONG-TAILED SHEEP.

Ovis aries dolichura, sive *Tscherkessica*, PALLAS. *Mouton à longue queue*,
DESM.

The tail of this breed is so long as to trail upon the ground. The horns are middle-sized, and twist spirally from the side of the head. The wool is coarse, and frequently black. This variety, as yet obscurely known, is found in Circassia and the south of Russia.

Among the European breeds, one of the most remarkable is

* The tails of the Persian sheep are so heavy, according to Chardin, that a little go-cart or board with a pair of wheels is sometimes placed beneath them.

† *History of Quadrupeds*, p. 71. edition of 1807.

‡ *Animal Kingdom*, vol. iv. p. 330.

THE MANY-HORNED SHEEP OF ICELAND.

Ovis aries polyacrata, LINN. GMEL. *Ovis Gothlandica*, PALLAS. *Brebis à plusieurs cornes*, BUFFON.

This is a small variety, with large irregular horns, varying in number from two to six, or even more, and not turned spirally, but simply curved backwards, upwards, or to one side. The coat of this species shows a beautiful adaptation to the rigours of the climate to which it is exposed. It consists as it were of three layers, 1st, A long coarse hair; 2dly, A thick intermediate wool; and, 3dly, A fine close interior down. The head, tail, and extremity of the limbs, are covered with short hard hair. The hoofs are long, narrow and irregular, from their living so much among the soft snow, which scarcely wears them. Another breed, large and white, likewise occurs in Iceland, distinguished by the same peculiarities in the form and number of the horns. This has probably been obtained by a cross from some continental race. The Icelanders feed their sheep, when the summer crop happens to fail, on fish bones. They also observe that their flocks fatten rapidly when they can obtain a good supply of scurvy-grass. Milk seems abundant in this northern breed. Van Troil says that each ewe yields from two to six quarts a day*. I believe the smaller variety also occurs in the Feroë Isles.

I may observe, that Dicuil, in his book “*De Mensura Orbis Terræ*,” written in the year 825, describes certain islands, which evidently appear to be those of Feroë, and which he mentions to have been “*plenæ innumerabilis ovibus*.” At that period they were not inhabited by man, though they had been so, partially, about a century before, during which time the sheep may have been introduced. Debes, in his History of Feroë, written in 1670, states, that on Little Dimon there were wild sheep. That island was then, as it is now, uninhabited by human beings. It is very small and steep, and of the form of a haystack, from whence its name. It is about 1300 feet high, with the sides sloping at an angle of near 40°. Landt, the English translation of whose description of Feroë was published in 1810, says of that island, that it “contains a great number of wild

* *Letters on Iceland*, p. 133.

sheep, which are black, of a small size, have short curled wool, and do not readily mix with the others introduced into the island; their flesh also has a peculiar dark appearance, and in taste approaches near to that of other wild animals. These wild sheep shelter themselves from the severity of the weather in some natural caverns found in the island *."

THE WALLACHIAN SHEEP.

Ovis aries strepticeros.

The horns of the male are remarkable for their length and upright position. They form a complete spiral turn at their base, and then ascend spirally upwards. In the female the horns are divergent, and twisted on their own axes. The fleece is long, coarse, and undulating. The ears are small and drooping, and the tail long. The general colour is white, and the dimensions equal those of an ordinary sized sheep. This is a handsome showy animal, common in Hungary and Wallachia, from which numerous flocks are driven to the markets of Vienna. Belonius says they occur in Crete, and the ancients are supposed to have described them under the name of *Strepticeros* †. By some they have been regarded as a distinct species.

Of all the European breeds, the most celebrated is

THE MERINO OR SPANISH SHEEP.

Ovis aries Hispanica, GMEL. *Ovis Hispanica*, LIN. *Aman. Acad.* t. iv.

This variety is distinguished by the size and strength of its

* I am indebted for the preceding information to W. C. Trevelyan, Esq. younger of Wallington, who visited the Feroe Islands in 1821, and found the remnants of the wild race in no way dependent on or under the control of man. They are sometimes caught by dogs; but can seldom be obtained, except by being shot, or intercepted in a narrow space, and driven over the cliffs. They seemed to Mr Trevelyan to resemble goats in their hinder quarters; and their flesh, though lean, was good eating. Their wool was remarkably short.

I may take this opportunity of stating, that my friend Dr Gillies mentions, that in some of the districts of South America in which he has lately resided, the children use tame sheep as ponies, on which they ride to school. On this kind there is probably "more cry than woo'."

† *Plin. Nat. Hist.* lib. xl. cap. 373.

horns, which form a regular spiral turn on the sides of the head, and by its wool, twisted in cork-screw ringlets, and beautifully soft and fine. Its natural colour, however, is not very pure, being rather of a tarnished or dingy hue*. The breed, though said originally to have come from Barbary†, is now widely spread, and in great perfection, over Spain; and many of the most esteemed of the French races owe their excellence to a preponderance of the Merino blood.

There seem to be two principal kinds of sheep in Spain, the *coarse woolled*, which always remain in their native pastures, and are housed every night in winter; and the *fine woolled*, which are always in the open air, and travel every summer from the cool mountains of the northern parts of Spain, to feed in winter on the southern and warmer plains of Andalusia, Mancha, and Estremadura‡. M. Bourgoanne, a French gentleman, who resided many years in Spain, gives the following account of the wandering sheep of Segovia: "It is in the neighbouring mountains that a part of the wandering sheep feed during the fine season. They leave them in the month of October, pass over those which separate the two Castiles, cross New Castile, and disperse themselves in the plains of Estremadura and Andalusia. For some years past, those of the two Castiles, which are within reach of the Sierra Morena, go thither to pass the winter, which, in that part of Spain, is more mild; the length of their day's journey is in proportion to the pasture they meet with. They travel in flocks from 1000 to 1200 in number, under the conduct of two shepherds, one of whom is called the *Mayoral*, the other the *Zagal*. When arrived at the place of their destination, they are distributed in the pastures previously assigned them. They return in the month of April; and, whether it be habit, or natural instinct, that draws them towards the climate which at this season becomes most proper for them, the inquie-

* The covering of the Merinos is remarkably greasy, and its soiled colour probably arises from the quantity of dust and other impurity collected in consequence.

† In *Dillon's Travels*, the Spanish sheep are asserted to have been primarily derived from England. See also on this subject Pennant's *British Zoology*.

‡ *Encyc. Brit.* vol. xix. art. *Sheep*.

tude which they manifest might, in case of need, serve as an almanac to their conductors *.”

The *Leonese races* (among which that called *Cavagne* is the most distinguished), after having been cantoned during the winter near Merida in Estremadura, on the left bank of the Guadiana, are marched about the 15th of April, in flocks of two and three thousand, across the Tagus at Almarez to Villa Castin, Trescasas, Alfaro, Espinar, and other stations, where their fleeces are shorn. This operation being completed, each division continues its route towards the province of Leon, where they are partitioned into flocks of 500 over the pasturages of Cervera, in the neighbourhood of Aquilar del Campo.

The *Soriane races* dwell during winter in the confines of Estremadura, Andalusia, and New Castile. Towards the end of April they cross the Tagus, at Talaveyra de la Reyna, and the Puente del Arzobispo, when their march is directed towards Madrid, from whence they travel to Soria, where a portion is placed among the neighbouring mountains, and a portion crosses the Ebro, and is located on the pastures of Navarre and the Pyrenees.

All these wandering races are known under the general denomination of *Transhumante* †. The most esteemed amongst the stationary tribes, or *Estantes*, dwell behind the gorges of the Guadarama and of Somo-sierra, and in the environs of Segovia, near certain residences, called *Esquileos*, where the sheep-shearing is carried on ‡.

* *Bourgoanne's Travels*, vol. i. p. 53.

† “In the 16th century, the travelling sheep were estimated at seven millions: under Philip III. the number was diminished to two millions and a half. Ustariz, who wrote about the beginning of the 18th century, made it amount to four millions. The general opinion is, that at present it does not exceed five millions. If to this number the eight millions of stationary sheep be added, it will make nearly thirteen millions of animals, all managed contrary to the true interests of Spain, for the advantage of a few individuals. For the proprietors of stationary flocks also have privileges which greatly resemble those of the masters of the Mesta. According to Arriquebar, Spain contains eight millions of fine woolled sheep, ten millions of coarse woolled, and five hundred thousand bulls, oxen and cows.”—*Encyc. Brit.* 6th edit. vol. xix. p. 222.—*Note.*

‡ See Desmarest, in *Dict. des Sciences Nat.*, t. xxxiii. art. *Moulon*; and Tessier's *Instruction sur les Bêtes à laine*.

None of the other Spanish breeds equal the Leonese, either in the form, the abundance, or the quality of the wool.

Mr Arthur Young has given a very full, accurate, and interesting account of the Pyrenean or Catalanian race; and the great importance of the Spanish sheep in general, will probably justify a longer extract than usual from that well known writer.

—“On the northern ridge, bearing to the west, are the pastures of the Spanish flocks. This ridge is not, however, the whole; there are two other mountains, quite in a different situation, and the sheep travel from one to another as the pasturage is short or plentiful. I examined the soil of these mountain pastures, and found it in general stony; what in the west of England would be called a *stone-brash*, with some mixture of loam, and in a few places a little peaty. The plants are many of them untouched by the sheep; many ferns, narcissus, violets, &c.; but burnet (*Poterium sanguisorba*), and the narrow-leaved plantain (*Plantago lanceolata*), were eaten, as may be supposed, close. I looked for trefoils, but found scarcely any. It was very apparent that soil and peculiarity of herbage had little to do in rendering these heights proper for sheep. In the northern parts of Europe, the tops of mountains half the height of these (for we were above snow in July) are bogs; all are so, which I have seen in our islands; or, at least, the proportion of dry land is very trifling to that which is extremely wet. Here they are in general very dry. Now, a great range of dry land, let the plants be what they may, will in every country suit sheep. The flock is brought every night to one spot, which is situate at the end of the valley on the river I have mentioned; and near the port or passage of Picada, it is a level spot, sheltered from all winds. The soil is eight or nine inches deep of old dung, not at all enclosed: from the freedom from wood all around, it seems to be chosen partly for safety against wolves and bears. Near it is a very large stone, or rather rock, fallen from the mountain. This the shepherds have taken for a shelter, and have built a hut against it: their beds are sheep-skins, and their door so small that they crawl in. I saw no place for fire, but they have it, since they dress here the flesh of their sheep, and in the night sometimes keep off the bears by whirling firebrands: four of them, belonging to the flock mentioned above, lie here. I viewed their flock very carefully, and, by means of our guide and interpreter, made some inquiries of the shepherds, which they answered readily and very civilly. A Spaniard at Venesque, a

city in the Pyrenees, gives 600 livres French (the livre is 10½d. English) a-year for the pasturage of this flock of 2000 sheep. In the winter he sends them into the lower part of Catalonia, a journey of twelve or thirteen days; and when the snow is melted in the spring, they are conducted back again. They are the whole year kept in motion, and moving from spot to spot, which is owing to the great range they every where have of pasture. They are always in the open air, never housed or under cover, and never taste of any food but what they can find on the hills.

“ Four shepherds, and from four to six large Spanish dogs, have the care of this flock: the latter are in France called of the Pyrenees breed; they are black and white, of the size of a large wolf, a large head and neck, armed with collars stuck with iron-spikes. No wolf can stand against them: but bears are more potent adversaries; if a bear can reach a tree, he is safe; he rises on his hind legs with his back to the tree, and sets the dogs at defiance. In the night the shepherds rely entirely on their dogs; but, on hearing them bark, are ready with firearms, as the dogs rarely bark if a bear is not at hand. I was surprised to find that they are fed only with bread and milk. The head shepherd is paid 120 livres a-year wages, and bread; the others 80 livres, and bread; but they are allowed to keep goats, of which they have many, which they milk every day. Their food is milk and bread, except the flesh of such sheep or lambs as accidents give them. The head shepherd keeps on the mountain top, or an elevated spot, from whence he can the better see around, while the flock browses the declivities. In doing this the sheep are exposed to great danger in places that are stony; for, by walking among the rocks, and especially the goats, they move the stones, which rolling down the hills, acquire an accelerated force, enough to knock a man down, and sheep are often killed by them; yet we saw how alert they were to avoid such stones, and cautiously on their guard against them. I examined the sheep attentively. They are in general polled, but some have horns, which, in the rams, turn backwards behind the ears, and project half a circle forward: the ewes' horns turn also behind the ears, but do not project; the legs white or reddish; speckled faces, some white, some reddish; they would weigh fat, I reckon on an average, from 15 lb. to 18 lb. a quarter; some tails short, some left long. A few black sheep among them; some with a very little tuft of wool on their foreheads. On the whole, they resemble those on the South Downs; their legs are as short as those of that breed,—a point which merits

observation, as they travel so much, and so well. Their shape is very good; round ribs, and flat straight backs; and would be with us reckoned handsome sheep, all in good order and flesh. In order to be still better acquainted with them, I desired one of the shepherds to catch a ram for me to feel, and examine the wool, which I found very thick and good, of the carding sort, as may be supposed. I took a specimen of it, and also of a hoggit or lamb of last year. In regard to the mellow softness under the skin, which, in Mr Bakewell's opinion, is a strong indication of a good breed, with a disposition to fatten, he had it in a much superior degree to many of our English breeds, to the full as much so as the South Downs, which are for that part the best short-woolled sheep which I know in England. The fleece was on his back, and weighed, as I guessed, about 8 lb English; but the average, they say, of the flock is from 4 to 5, as I calculated by reducing the Catalonian pound of 12 ounces to ours of 16, and is all sold to the French at 30s. the pound French. This ram had the wool of the back part of his neck tied close, and the upper tuft had a second knot by way of ornament; nor do they ever shear this part of the fleece for that reason; we saw several in the flock with this species of decoration; they say that this ram would sell in Catalonia for 20 livres. A circumstance which cannot be too much commended, and deserves universal imitation, is the extreme docility they accustom them to. When I desired the shepherd to catch one of his rams, I supposed he would do it with his crook, or probably not be able to do it at all; but he walked into the flock, and, singling out a ram and a goat, bid them follow him, which they did immediately; and he talked to them while they were obeying him, holding out his hand as if to give them something. By this method he brought me the ram, which I caught and held without difficulty*."

Every fleece is said to contain three sorts of wool. The first is on the back and belly; a second sort is obtained from the neck and sides; and the coarsest kind comes from the breast, shoulders and thighs. More than 9,700,000 pounds weight of wool is (or was) annually exported from Spain; of which, notwithstanding the fine quality and abundance of the British kinds, a great proportion comes to England.

The form of the Merino race does not accord with the English ideas of symmetrical proportion. The *throatiness*, or pen-

* *Annals of Agriculture*, vol. viii. p. 195.

dulous skin beneath the throat, is highly offensive to the eye of an English breeder. It is, however, much esteemed in Spain, as indicating a tendency to a fine and heavy fleece; although Lord Somerville has proved, that there is no reason to conclude that deformity in shape is in any degree necessary to the production of fine wool*.

Merinos were introduced into England in 1788, and fresh attention was bestowed on them, in consequence of the sales by his Majesty, George III., which commenced in 1804. The Merino Society was instituted in 1811, for the purpose of experimenting on the breed, and facilitating its extension throughout the country.

We shall now advert to some of the principal kinds of our own island, and briefly, because though their importance in an economical point of view exceeds that of all others, the works in which their history and attributes may be found detailed are more easily accessible to the English reader.

From the reign of Edward I., the production of wool was regarded as an object of the highest importance to the kingdom, and repeatedly excited the attention of the legislature from the time of Edward III. to that of Henry VII.† It has been remarked as a singular circumstance, (perhaps confirmatory of the opinion of Dillon and others, regarding the origin of the Merino race), that in early times English sheep were transported to Spain. “King Edward IV.” says Baker, “enters into a league with John King of Arragon, to whom he sent a score of Cotsal ewes and four rams, a small present in show, but great in the event, for it proved of more benefit to Spain, and more detrimental to England, than could at first have been imagined‡.” This was probably about the year 1466. For more than a century preceding, the woollen manufactures had been patronised and encouraged, and, in after times, the religious wars of the Netherlands forced numerous artisans, both as exiles and emigrants, to the British shores. The value of wool

* *Supplement to Encyclopædia Britannica*, vol. i. p. 175.

† In the time of Edward III. exported wool brought L. 2, 10s. a hack, which was a large sum at that early period.

‡ *Chron.* fol. 206

exported, in the reign of Edward III., amounted to L. 150,000 per annum; there is now shorn in England, but no longer exported, a quantity estimated at L. 5,000,000 Sterling, the produce of which, with that of the Spanish and Saxon imported wools, has been estimated as exceeding L. 20,000,000 per annum *. "A respectable and intelligent manufacturer," says Mr Colquhoun, "who was examined before a Committee of the House of Commons in 1800, estimated the produce of the woollen manufacture at L. 19,000,000 a-year; and Mr Macarthur, in 1803, valued the whole, including the fine fabrics from foreign wool, at L. 25,560,000. We see by Lord Sheffield's printed report, at the meeting at Lewis Wool Fair, on the 27th July 1812, that, on a medium of the six years from 1806 to 1811, both inclusive, there were imported 7,329,795 pounds of Spanish wool; the average price of which, on the 16th July, was 7s. 9d. a pound. The manufactures from British wool may be estimated at L. 20,000,000, and those from Spanish wool at perhaps L. 6,000,000. Total L. 26,000,000. Allowing L. 8,000,000 for the raw materials, the net value will be L. 18,000,000 †."

The great object in the breeding and rearing of sheep, is of course to combine the production of the finest wool and the most delicate flesh upon the least quantity of bone, at the smallest possible expense, and without producing feebleness or delicacy of constitution in the animal. This I presume would consti-

* *Animal Kingdom*, vol. iv. p. 334.

† *Treatise on the Wealth, Power, and Resources of the British Empire*, &c. London, 1814.

By a recent parliamentary return, it appears that the whole quantity of foreign wool imported into London and the out-ports, for the last six years, was as under:—

Year ending 5th January 1824,.....	19,378,249 lb.
1825,.....	22,572,617
1826,.....	43,837,961
1827,.....	15,996,715
1828,.....	29,142,290
1829,.....	30,246,898

Of the quantity in the last of these years, there were imported,
 From Germany,.....22,015,585 lb.
 From Spain and the Canaries,..... 3,808,662
 From New South Wales and Van Diemen's Land, 1,574,186

tute the *beau idéal* of the sheep-farmers from Abel to the Et-trick Shepherd, and it seems attainable chiefly by choosing breeders from individuals possessed of the most beautiful general proportions, and crossing them successively with such as partake in the most characteristic degree of one or more of the desired qualifications. As we approach towards the desired result, crossing ought then to be desisted from, and we should breed with the most perfect of both sexes of the same kind. It is evident that the idea of a *perfect sheep* (if any thing perfect exists either in the moral or pastoral world), must, to a certain extent, vary with the circumstances of climate and locality. In the vicinity of a great city, where flesh is usually more valuable than wool, an aptitude to fatten will be preferred to a fine and abundant covering. By the unrivalled skill of the British breeders, each district may, however, be said to possess a race adapted to its physical and social circumstances, and many of the improved kinds are now so near perfection, that little else need be desired than the extension to all parts of the united kingdom of the same general principles and modes of treatment.

The principal ram breeders save annually 20, 30, or perhaps 40 ram lambs, in the choice of which they are led more by blood and parentage, than by form, on which, at an early age, little or no dependence can be placed. "Their treatment," says Mr Marshall, "from the time they are weaned, in July or August, until the time of shearing, the first week in June, consists in giving them every indulgence in keep, in order to push them for show; it being the common practice to let such as are fit to be let the first season, while they are yet yearlings—provincially shearhogs. Their first pasture after weaning, is pretty generally, I believe, clover that has been mown early, and has got a second time into head; the heads of clover being considered as a most forcing food for sheep. After this goes off, turnips, cabbages, colewort, with hay, and (report says) with corn. But the use of this the breeders severally deny, though collectively they may be liable to the charge. Be this as it may, something considerable depends on the *art of making up*, not lambs only, but rams of all ages. Fat, like charity, covers a multitude of faults; and besides, is the best evidence of their

fattening quality which their owners can produce (*i.e.* their natural propensity to a state of fatness), while in the fatness of the shearhogs is seen their degree of inclination to fat at an early age. Fattening quality being the one thing needful in grazing stock, and being found, in some considerable degree at least, to be hereditary, the fattest rams are of course the best, though other attachments, well or ill placed, as to form or fashionable points, will perhaps have equal or greater weight in the minds of some men even in this enlightened age. Such shearlings as will not make up sufficiently as to form and fatness, are either kept on to another year to give them a fair chance, or are castrated, or butchered while shearhogs*."

It is well known that Mr Bakewell, in the year 1789, made 1200 guineas by three rams, 2000 of seven, and of his entire stock 3000 guineas. Four hundred guineas have been repeatedly given for the use of a single ram. About this same time there were several other breeders who made from 500 to 1000 guineas each by letting some of the best of their breed, and it has been calculated, that, in the year just named, at least £10,000 were cleared in the midland counties by this practice alone. These great prices, however, were not given by graziers for the purpose of improving their stock, but rather by principal breeders with a view to obtain a stock of rams of the improved race, which they let out again to breeders of an inferior class†.

The manner in which Mr Bakewell improved the Leicestershire breed to the degree of excellence which they have now attained, is, notwithstanding the comparatively recent period of his exertions, still a matter of doubt and disputation. Some are of opinion that he effected it by a cross with the Wiltshire, an improbable idea, according to Mr Marshall, as their form altogether contradicts it. If any cross was used, the Ryeland breed, whether we regard the form, the wool, the size, the flesh, or the fattening quality, seems the most probable instrument of improvement. Mr Marshall is of opinion that no cross with any alien breed was used at all, but that the improvement was effected by selecting individuals from the several kindred breeds or varieties of long-wooled sheep by which Mr Bakewell was sur-

* *Midland Counties*, vol. i.

† *Bewick's Quadrupeds*, p. 64.

rounded on almost every side, and by breeding *in and in* with this selection; solicitously seizing the superior accidental varieties which were produced, associating these varieties, and still continuing to select with judgment the superior individuals.

The following is Mr Culley's description of the best form of a ram: his head should be fine and small; his nostrils wide and expanded; his eyes prominent, and rather bold and daring; ears thin; his collar full from his breast and shoulders, but tapering gradually all the way to where the head and neck join, which should be very fine and graceful, being perfectly free from any coarse leather hanging down; the shoulders broad and full, and at the same time joining so easy to the collar forward, and chine backward, as to leave not the least hollow in either place; the mutton upon his arm or fore-thigh must come quite to the knee; his legs upright, with a clear fine bone, being equally clear from superfluous skin and coarse hairy wool, from the knees and hough downwards; the breast broad and well forward; which will keep his fore-legs at a proper wideness; his girth or chest full and deep; and, instead of a hollow behind the shoulders, that part, by some called the fore-flank, should be quite full; the back and loins broad, flat, and straight, from which the ribs must rise with a fine circular arch; his belly straight; the quarters long and full, with the mutton quite down to the hough, which should neither stand in nor out; his twist deep, wide, and full, which, with the broad breast, will keep his fore-legs open and upright; the whole body covered with thin pelt, and that with fine, bright, soft wool*. We shall add the characters of Mr Bakewell's ewes and wedders, which are supposed to have surpassed all others in beauty of form. The head is long, small, and hornless, with ears somewhat long, and standing backwards, and with the nose shooting forward. The neck thin and clean towards the head, but taking a conical form; standing low, and enlarging every way at the base; the fore-bend altogether short. The bosom broad, with the shoulders, ribs, and chine extraordinary full; the loin broad, and the back bare. The haunches comparatively full towards the hips, but light downwards; being altogether small in proportion to

* Culley on *Live Stock*, p. 103.

the fore-parts. The legs of moderate length, with the bone extremely fine; the bone throughout remarkably light. The carcass, when fully fat, takes a remarkable form; much wider than it is deep, and almost as broad as it is long. Full on the shoulder, widest on the ribs, narrowing with a regular curve towards the tail, and approaching somewhat the form of a turtle. The pelt is thin, and the tail small. The wool is shorter than long wools in general, but much longer than the middle wools; the ordinary length of staple 5 to 7 inches, varying much in fineness and weight.

Mr Marshall mentions that he has seen a rib of the above breed contrasted with one of a Norfolk sheep, and that the disparity was striking. The latter was nearly twice the size, while the meat which covered the former was three times the thickness; so that the proportion of meat to bone was incomparably greater in the one than in the other. "It is common," says Mr Marshall, "for the sheep of this breed to have such a projection of fat upon the ribs, immediately behind the shoulders, that it may be easily gathered up in the hand, as the flank of a fat bullock. Hence it has gained in technical language the name of the *fore-flank*; a point which a modern breeder never fails to touch in judging of the quality of this breed of sheep. What is perhaps still more extraordinary, it is not rare, for the rams at least, of this breed, to be "cracked on the back;" that is, to be cloven along the top of the spine, in the manner fat sheep generally are upon the rump. This mark is considered as an evidence of the best blood*."

Mr Princep of Croxall fattened a Leicestershire sheep, the fat on the ribs of which measured four inches deep; and a three-year old wedder, belonging to Mr Culley, which was killed at Alnwick in October 1787, had more than seven inches of solid fat upon the ribs. The whole of his back was like the fattest bacon.

Mr Culley, in his "Observations on Live Stock," commences with the *Lincolnshire sheep*, which are of a large size, big-boned, and afford a greater quantity of wool than any other kind. This is probably owing to the rich fat marshes on which they feed. Their flesh, however, is coarse, leaner, and not so

* *Midland Counties*, vol. i. p. 398.

finely flavoured as that of the smaller breeds. They are spread over most of the midland counties. Their carcasses are thin and weak; their legs rough and large-boned, their faces white, and their wool very heavy. In a specimen examined by Sir Joseph Banks, the wool measured 21 inches in length, and the average weight of the fleece is from 8 to 14 pounds, or, in proportion to the carcass, as 1 to 16½. These sheep seldom fatten in a reasonable time in any part of this island, except Romney Marsh, the fens of Lincolnshire, or other rich grazing grounds.

The *Dorsetshire breed* are tall and light in their body; their faces are white, their legs long, and their wool short. Their shoulders are broad at the top, and lower than the hind quarters. The back is tolerably straight, the carcass deep, and the loins broad. The fleeces seldom weigh above three pounds and a half, and the staple is not often more than two inches long. This breed is very prolific, and the ewes occasionally bring forth twice a-year. It is from them that the luxurious tables of London are supplied with Christmas lamb. The victims are reared in little dark cabins; and the ewes are kept in a neighbouring field, and fed with oil-cakes, corn, hay, &c., and introduced, after certain intervals, to give suck to their young. The latter are kept very warm and clean, and their lodgings are constantly littered with fresh straw. The wool of the Dorsetshire sheep, though not abundant, is of a superior quality, the fine Wiltshire cloths being fabricated from it. The breed occurs in several of the southern counties, but in its best and most characteristic form only in Dorsetshire and Wiltshire.

The *Tees Water breed* are among the largest in the island. Their flesh is fatter and finer grained than that of the Lincolnshire sheep. The old race was not held in great estimation, but, having been crossed by the Dishley blood, its characters have been essentially altered and improved. They are very prolific, and instances have occurred of their producing five young at a birth. Mr Eddison had a ewe which brought forth sixteen lambs in four years, of which nine were lambed within a period of eleven months. These sheep have been known to weigh 62 pounds 10 ounces per quarter avoirdupois.

The *South Down* or *Sussex sheep* are a hardy race, which feed and thrive well on hilly pastures. The districts of which

they are characteristic are composed of dry chalky downs, which produce a short sweet herbage. Their fleece is short and fine, seldom exceeding three pounds in weight. The mutton is of superior delicacy, and of a finer flavour than that of most breeds of the southern parts of England. They now abound on Salisbury Plains and the Wiltshire Downs.

The *Ryeland* or *Herefordshire sheep* are of small size, with very fine short wool. They derived their name from inhabiting a tract of apparently poor land, which, though it now bears crops of all kinds of grain, was at one time thought incapable of yielding any thing else than rye. Their carcases are pretty well formed, and weigh from 10 to 18 pounds per quarter. The fleece weighs about 1½ or 2 pounds. It is short, soft, and fine; and while the breed continued unmixed, it was supposed to bear the best wool of any sheep in Britain. It has been called "*Leominster Ore*," and was thus eulogized more than a couple of centuries ago, by old Michael Drayton:—

"Where lives the man so dull on Britain's farthest shore,
To whom did never sound the name of Lemster Ore;
That with the silk-worm's web for smallness doth compare?"

The ringlets of the wool are equal in fineness to those of the Merino race, but they are rougher, in consequence of being more irregular in regard to size and surface. Though the wool does not felt well, it is supposed to produce the finest cloth of any in England.

The *Herdwick sheep* are a mountain breed, found in Cumberland, at the head of the rivers Esk and Uddon. "The few farms where they are bred are called Herdwicks, that is, the district of the Herds, from the circumstance of the sheep having, from time immemorial, been there farmed out to herds at a certain sum per annum*." They are hornless, with speckled faces and legs, and the wool is short. Those of the purest breed have only a few black spots on the face and legs. The fleece, which is thick and matted, seldom exceeds 2½ pounds, and is among the coarsest of the short-woolled breeds. The Herdwick sheep are small, lively and active, easily sup-

* Bingley's *British Quadrupeds*, p. 378.

porting themselves, even during the severest storms, by the quickness with which they scratch away the snow from the most scanty herbage. They are usually hornless; but Mr Culley seems to think that they have been crossed by the Heath Rams, from the circumstance of some of the males being furnished with horns, and from some “kempy hairs” being usually intermingled with the wool.

The *Cheviot sheep*, like most of the preceding, are likewise hornless. They are usually white-faced and white-legged, with an open countenance, lively prominent eyes, the body long, and the legs fine, clean, and small-boned. The mutton is excellent; and the carcase weighs from 12 to 18 pounds per quarter. The weight of the fleece is about 3 pounds. This is a hardy mountain breed, thriving well on waste and sterile lands. They are characteristic of the hilly district of the north-west parts of Northumberland, and are also bred on the hills around Cheviot, from which they derive their name. Their wool is in great demand, and brings a high price. The breed has been much improved of late years, though there is still a want of depth in the fore-quarter, and of breadth both there and on the chine. They were imported by Sir John Sinclair to the heathy mountains of the Scottish Highlands.

The *Wiltshire sheep* are nearly allied to the Dorsetshire breed. They have long white faces and legs. The horns encircle the ears, and lie back very close upon the neck. The wool is short and close, but not very fine. There is scarcely any under the belly. The legs are large-boned. Varieties of this breed are spread through many of the southern and western counties of England. The mutton is excellent; but they are not easily fattened, except on good land, and are therefore not a very profitable stock. The fleece weighs from 3 to 4½ pounds.

The *Exmoor sheep* have long wool, and white faces and legs. The head, neck, and bones, are small, and delicately formed; but the carcase is too narrow and flat-sided. The fleece weighs about 6 pounds; and a wedder of two years and a half gives from 15 to 18 pounds per quarter.

The *Black-faced* or *Heath sheep* have a wild unreclaimed aspect. Their faces and legs are black, and their horns large,

and more spirally twisted than those of the Merinos. The female is frequently hornless. The fleece is long, coarse, and shaggy, and extends over the forehead and lower jaw. This is an active and hardy race, pretty widely spread over many of our mountainous tracts, and stretching from the north-west districts of Yorkshire, over parts of Northumberland, Lancashire, Westmoreland, and northwards beyond Fort William in Inverness-shire. The flesh is singularly fine and high-flavoured. The improved breed are equally hardy, and more symmetrical in their form and proportions, with a finer wool. The fleece weighs from 3 to 4 lb.

The *Norfolk sheep* have large spiral horns, black faces, and long large-boned dark-grey legs. The carcass is small, lengthened, thin, and weak, with a narrow chine, and weighs from 16 lb to 20 lb per quarter. The flesh does not stiffen well in hot weather, and is supposed to become tainted sooner than most others. The wool is short and fine, and seldom weighs more than 2 lb. This breed is of a restless disposition, and difficult to retain in limited pastures. It is a voracious eater.

The *Irish sheep*, described by Mr Culley, who saw 95,000 at the great fair of Ballinasloe, are ugly and ill-formed, compared with the British breeds. Their bodies are of great size, and their legs long, thick, crooked, and of a grey colour. Their faces are likewise grey, and their heads long, with large flagging ears and sunken eyes. The neck, which is long, is set on below the shoulders, and the breast is narrow, short, and hollow, both before and behind the shoulders. This breed is flat sided, with narrow hairy backs; the tail is low set, and the hind quarters drooping. Mr French and other breeders have, however, improved the Irish sheep, by the importation of English rams.

The *Shetland sheep* are small handsome animals, with short fine fleeces. They are generally hornless, and their weight seldom exceeds 40 lb. Their fleeces weigh on an average about 2 lb. When properly dressed, the wool is of a pure and glossy white. The breed is very hardy, and feeds on sea-weed during the absence or deficiency of better food. "With respect to their wool," says Mr Bingley, "it is of a texture so soft and

oottony, that it is adapted to the finest manufactures; and, in some instances, has been found to rival even the Spanish wool *.” Stockings fabricated from Shetland wool have been known to sell for six guineas a pair. The skin with the fleece on may be converted into a valuable fur, and in that condition has been sometimes exported from this country to China. It also forms excellent leather aprons. There appears to be two varieties of the Shetland sheep. Of these, the one which is considered as the native race, possesses the finest wool; but their number is now greatly diminished, and in some places they have been almost entirely supplanted by foreign breeds. The wool of this variety is coarse above, but soft and fine below. Of the Shetland sheep it has been observed: “ They have three different successions of wool yearly, two of which resemble long hair, more than wool, and are termed by the common people *fors* and *scudda*. When the wool begins to loosen in the roots, which generally happens about the month of February, the hairs or *scudda* spring up; and when the wool is carefully plucked off, the tough hairs continue fast, until the new wool grows up about a quarter of an inch in length, then they gradually wear off; and when the new fleece has acquired about two months’ growth, the rough hairs, termed *fors*, spring up, and keep root, until the proper season for pulling it arrives, when it is plucked off along with the wool, and separated from it at dressing the fleece, by an operation called *forcing*. The *scudda* remains upon the skin of the animal, as if it were a thick coat, a fence against the inclemency of the seasons, which provident Nature has furnished for supplying the want of the fleece. The wool is of various colours. The silver-grey is thought to be the finest; but the black, the white, the *mourat* or brown, is very little inferior; though the pure white is certainly the most valuable for all the finer purposes in which combing wool can be used †.”

The *Hebridean Sheep*, as described by Mr Macdonald, is among the smallest of its kind. Its shape is thin and lank, and its horns are usually straight and short. The face and legs

* *British Quadrupeds.*

† Sir John Sinclair on the different Breeds of Sheep, &c.—Appendix, No. 4. *Account of the Shetland Sheep*, by Thomas Johnston, p. 79.

are white, the tail very short, and the wool of various colours, sometimes of a bluish-grey, brown, or deep russet, and sometimes all these colours meet in the fleece of one animal. Where the pasture is favourable, and the general management judicious, the wool is very fine, and resembles that of Shetland in softness. "The average weight of this poor breed, even when fat, is only 5 or 5½ lb. per quarter, or nearly about 20 lb. per sheep. It is often much less, only amounting to 15 or 16 lb.; and the price of the animal's carcass, skin and all, is from 10s. to 14s. We have seen fat wethers sold in the Long Island at 7s. a-head, and ewes at 5s. or 6s. The quantity of wool which the fleece yields is equally contemptible with the weight of the carcass. It rarely exceeds 1 lb. weight, and is often short of even half that quantity. The quality of the wool is different on different parts of the body; and inattention to separating the fine from the coarse, renders the cloth made in the Hebrides very unequal and precarious in its texture. The average value of a fleece of this aboriginal Hebridean herd is from 8d. to 1s. Sterling. From this account, it is plain that the breed in question has every chance of being speedily extirpated.*"

In several of our northern counties there exists a remnant of an ancient race of sheep, distinguished by the yellow colour of the face and legs, and the dishevelled texture of the fleece, which is partly coarse and partly fine.

Bewick has described a small and singular variety under the name of *Dwarf Sheep*. It was brought from abroad; but the particular country is not mentioned. Its features were very grotesque; the wool growing round the head formed a kind of hood or ruff, before which stood its short erect ears. The under jaw protruded considerably beyond the upper, so as to leave the front teeth exposed, somewhat after the manner of the bull-dog; and the shortness of the nose, which lay almost immediately under a high projecting forehead, produced a very peculiar physiognomy. In Lincolnshire, there is a small kind, mentioned by Mr Culley under the name of *Dunkey*, which Mr Bewick supposes may be the same as the one first described.

In the preceding enumeration will be found the principal

* Macdonald's *Report of the Hebrides*, p. 447.

racés of British sheep. The list might easily be extended if we were to take into consideration all the less important varieties, and the numerous intermediate links which may be said to connect one characteristic kind with another. Mr Culley describes only 14 breeds in all. Mr Dickson adds to these two other varieties* ; and Mr Parkinson extends the roll to 37 peculiar races †.

The skill and perseverance of man have certainly been exerted in this matter to a wonderful extent, and with a most successful and beneficial result. The small *Dun-faced Sheep*, supposed to be the representative of the most ancient stock in this island, exhibits a singularly dissimilar form and aspect to the *improved Leicester* or *Dishley* race of modern times.

Our present limits will scarcely admit of our bestowing more than a glance upon the continental varieties, of which, indeed, the most important, those of Spain, have been already discussed.

The French sheep (*Ovis aries Gallica*, Encyclop. pl. 46, Figs. 2. and 3.), commonly called Mouton de Picardie, de Brie, de Beauce, are of medium dimensions, and measure about 2 feet 4 inches (French) in height at the shoulder. The rams are usually hornless, the head narrow, and, in common with a portion of the neck and legs, covered with a short, rough, hairy coating; the wool of the body is coarse and abundant, and hangs in large separate masses, composed of straight untwisted filaments. White is the usual colour.

The French writers distinguish several varieties, or mixed races, which, like our own, commonly bear the name of the district of which they are the most characteristic.

La Flandrine is long and tall, and is supposed to have originated from a cross by an African ram. It is also called *Mouton de Texel*.

La Solognote has a fine slender head, usually hornless, and the wool frizzled at the extremity of the meshes only.

La Berichonne is distinguished by the length of its neck. The head is without horns, and furnished with wool on its summit. The fleece is fine, white, short, close, and frizzled.

* *Practical Agriculture*, vol. ii. p. 1135.

† *On Live Stock*, vol. i. p. 249.

La Roussillonnaise produces a very fine wool, which partakes of the nature of the Spanish fleeces, being spirally twisted in a similar manner. It has probably been crossed with the Merino race*.

There are many *demi-Merinos* in France, and of these the wool is usually longer, though less fine, than that of the true Spanish breeds.

The Saxon and Bohemian sheep furnish wool of a very excellent quality. I observe it stated in a recent newspaper, that there are 7,000,000 of sheep in Hungary, of which 3,000,000 belong to Prince Esterhazy†.

America has no indigenous domestic sheep; but, in the United States, exertions have been made to maintain or improve the imported breeds of England. "Merinos have been introduced at high prices; but it is found in the Atlantic States, that the Spanish sheep, accustomed to roam, do much mischief on small farms, and they are now mostly sent into the back settlements; nor is the object of woollen manufactures as yet in the States of the Union of equal importance with the clearing of land and growing crops: this branch of industry has consequently not continued to fix the national attention‡."

The unexpected length to which the two divisions of our present communication have already extended, will induce us to postpone the Natural History of the Goat to a future Number, where it will form the subject of a separate essay.

* See Desmaret's *Mammalogie*, p. 491, and Carlier's *Traité des Bêtes à laine*.

† Mr Colquhoun, in 1814, estimated the number of horses in Great Britain and Ireland at 1,800,000; of horned cattle at 10,000,000; and of sheep and lambs at 42,000,000; and calculated that these animals consumed, of hay, grass, straw, vetches, turnips, &c. to the value of L. 103,400,000.

‡ Griffith's *Animal Kingdom*, vol. iv. p. 342.

ON THE DISEASE OF THE HORSE, TERMED NAVICULAR. *By*
Mr CHARLES CLARK, Veterinary Surgeon, London. In a
Letter to the Editor.

VETERINARY INFIRMARY, STAMFORD STREET,

SIR,

LONDON, April 5. 1830.

HAVING perused an article on "Contraction of the Foot of the Horse," at page 215 of your Journal, I beg leave to offer some remarks on the same subject, suggested by the view which Mr Dick has taken of lameness in general, and more particularly of that complaint which he terms *Navicular Disease*, or Grogginess, the right understanding of which is a matter of some consequence; and, therefore, I hope to be allowed candidly to differ with him on certain points, without impeaching the general tenor of his communication. But so much has already been written on this subject, and the difficulties and evils of shoeing have been so often stated, that, unless some new light had appeared to Mr Dick, it seems rather surprising he should have put forward these observations, which do not appear as the result of his own practical knowledge; nor do they tend to set the matter finally at rest, but are merely a recapitulation of the views and treatment pursued by others, and his opinions respecting them, which opinions, as they are not founded on real experience of all he advances, are in some instances incorrect.

In tracing the rise and progress of foot lameness, this writer has chosen to ascribe great importance, indeed almost every thing, to the complaint which he calls *Navicular disease*, and which he says, No. 6, p. 646, "is sometimes the cause, and sometimes the effect, of contraction." In No. 7, at page 218, we are told, that he has "shown that contraction of the hoof is commonly an effect of the *navicular disease*;" and in other places, he clearly asserts that horses with contracted feet do not go lame unless this disease exists. If I were to search his essay for a definition of this magnified evil, it would appear to consist either in an ulceration of the small transverse or shuttle bone of the foot, or in an adhesion between it and the perforans tendon which passes under, and is attached immediately below it. This state of the foot is occasioned, according to Mr Dick, by all shoe-

ing, whether (as he calls it) *good* or *bad*; and although he evinces a preference for some shoes rather than others, and speaks in general terms of the necessity of liberty to the foot, nay, even goes so far as to call Mr Bracy Clark's jointed shoe the best, yet we are finally left to conclude, that these lamentable results will inevitably ensue, so long as horses are subjected to severe and fast labours on our turnpike roads; nor does he propose any new remedy, but reiterates all those which have been employed with acknowledged ill success for these hundred years, and only proposes as an alteration the unscientific resource of cutting out the nerves going to the foot.

Now, there are two principal points on which I disagree with this gentleman. In the first place, I do not believe that this description of disease exists in more than one-fourth of the cases that he calls navicular; and, next, I have yet to learn that it cannot be prevented by *any* mode of shoeing, since it never has hitherto occurred in that which I advocate.

Throughout his paper, Mr Dick has spoken in favour of allowing liberty to the foot, but it is very evident that his practice with expansive shoes has not been sufficient to enable him to know that no such disease ever arises during their use. This I have repeatedly stated in the *Lancet*, and in the *Farrier and Naturalist*, vol. i. p. 531, in an essay on this complaint, and experience has not produced at present a single contradictory case. To account for this on reasonable grounds, which is easy, it seems necessary to revert again to the reasoning formerly advanced in these papers.

When the expansive action of the horse's foot, which is admitted by all the agitators of this disease, is restrained by the fixed shoe and nails, there ensues a degree of inflammation in the cramped and fettered organ, the consequences of which cannot be exactly foretold, but are variously injurious according to the particular feet in which it may occur, and the circumstances in which the horse is placed. In all cases, absorption and subsequent contraction are induced, although with certain coarse feet this effect is not very obvious; in others, and by far the greater number of well-bred horses, we see the feet narrowed to two-thirds of their natural width, and the animals become confirmed cripples in a few years.

It *may* now happen at an uncertain period, perhaps before contraction has proceeded very far in appearance, that the terminating articulation of the foot formed by the coronet, coffin and shuttle bones, may become highly inflamed from the restraint and confinement that it suffers; and, in the first instance, a decreased secretion and quicker absorption of the synovial fluid (or joint oil) may lead to abrasion of the articular cartilage, followed by ossific deposit, or ulceration, or adhesion, or, in fact, by any of those phenomena which usually occur in inflamed joints from other causes. I say that those consequences *may* result from inflammation of the joint, but the important question is, what occasions this inflammation? Certainly the shoe,—the fixed, unyielding shoe,—which renders an otherwise expansive organ as rigid as a block of wood bound round with a ring of iron. By what means, then, shall we prevent this destructive inflammation, and these morbid effects? By a shoe which will permit the foot to perform its natural elastic functions without constraint, is the reasonable and direct answer; and I can admit no other solution of this subject, until Mr Dick, or any other person, brings sufficient proof, that, with the use of such a shoe, these complaints do actually occur.

I have used expansion shoes for several years on a considerable number of horses, and never have seen, that, while wearing them, a single horse became affected in this manner; while I can produce numerous testimonies from the most credible sources, attesting the benefit derived from them, and many instances where horses far gone in contraction and lameness have worked sound for years, and continued useful. These are facts which encourage me to speak boldly, and to regret that Mr Dick should have dwelt so lightly on the principle of shoeing pointed out both by reason, anatomy, and practice, as the only means of preventing the evils that he has described. He intimates a *belief*, for it is nothing more, No. 7, p. 222, that “if the objection to all these plans were obviated, the defence of the shoe enabling the animal to make those exertions we require of him, would in many instances produce *grogginess*, independent of shoeing in every other respect.” “It is the pace that kills,” he says elsewhere. Now, if such is the case, which I cannot believe, and which this gentleman merely assumes as his opinion, I ask, why these complaints were not

described by those acute observers, the ancient Roman veterinary authors, in times when they rode horses (observe, without iron shoes) on roads like our flagged causeway, and at a "*pace*" which, in many instances, appears to have exceeded ours? Why are they absolutely unknown at this day, in countries where shoes are not used? Or can Mr Dick assign a reason different from that which I have stated, for the absence of this disease among horses shod on the expansion system, and in the performance of regular hard work, both on the road and on the stones. The more we investigate and reason, the more clearly it will be seen that this disgraceful *grogginess*—a term, by the way, which scientific men should be ashamed to employ, and which bespeaks ignorance of its real causes,—that this malady is only known in the world as an inseparable attendant on the system of inflexible shoeing, and that, on the contrary, where no unnatural restraint of the foot is permitted, there will be no inflammation, and no subsequent disease.

Let me now proceed to offer proof of my second assertion, that navicular disease, as it is termed, does not exist in one-fourth of the cases in which it is predicated.

Mr Dick's paper purports to be an "*Essay on the treatment and prevention of contraction*;" but all this is nearly lost sight of as he proceeds, and we are at last left in doubt, though there *are* parts that would favour either supposition, whether contraction occasions this disease, or is an after consequence of it. The same question has lately been agitated in the London Veterinary Medical Society, by the chief supporters of the navicular doctrine, and with great warmth and difference of opinion on both sides; but they arrived, like this gentleman, at no conclusion at all, and *their* want of unanimity only evinces a general unsoundness in the prevalent notions held on this subject. In truth, navicular disease has of late been made a complete bugbear to hide the more common evil of contraction; and as nothing is easier during life, than to assert the presence of a complaint which can only be certified by dissection, so the most extravagant statements have been made respecting it, the correct latitude of which I will endeavour to define.

The old farriers, from time immemorial, when a horse was lame from the chronic effects of their shoeing, and they either

knew not why, or hesitated to condemn their own treatment, were accustomed to say that he had the *coffin-joint lameness*, a term fully as correct, and much more distinctive, than that employed by the higher professing veterinarians of the present day. They bled, and poulticed the foot, rowelled and fomented; and afterwards fired and blistered the coronet, very much as recommended by Mr Dick in the first part of his treatment, and their success also was of the same dubious kind as he describes. Such was the common course pursued in certain cases, when, twenty years ago, Mr Bracy Clark published his first Dissertation on the Foot of the Horse, in which he demonstrated its real expansive structure, and proved, by a long and decisive experiment, that the common shoe occasioned contraction, disease, and lameness, by confining its natural action. As long as it was possible, his doctrines were rejected by the veterinary profession, and contraction ascribed to other causes, though truth has now so far prevailed, that only a prejudiced few, and those whose ignorance precludes censure, continue to deny the baneful tendency of the prison shoe.

But, as no practicable mode of expansion shoeing was brought forward until some years after the publication of these discoveries, and by admitting the truth of these, they would have palpably condemned their own practice, it was natural for practitioners to avoid any notice of the fact, or otherwise to bring forward some other cause to which they might refer the mischief and lameness that was too general to be denied. To this motive the navicular disease, as it is now taught, owes its origin and notoriety. About the same period, it pleased the wisdom of the teachers at the Veterinary College to change the name of the small transverse bone of the foot, which had hitherto been very properly called the shuttle bone, from its remarkable similarity to a weaver's shuttle. There is a bone in the human *tarsus* or heel, which, from its likeness to the figure of a boat, is called the *os naviculare*; to the corresponding one in the horse's *tarsus* or hock, they gave a new Greek name, and transferred the word *navicular* to this little bone in the horse's foot, to which it does not in any manner apply, unless they deemed the bone to be the same as in the human skeleton, because it was about the same distance from the ground! It also happened, that a veterinary surgeon of considerable observation, and who has since adopted

expansion principles, took notice, in the course of his *post mortem* researches, of the diseased state of the coffin-joint, and in making it generally public, gave it the sounding title of *Navicular disease*. From this time forward, we have heard of little else but this old coffin-joint lameness under the new name. It was often ascribed to *concussion*, independent of the common shoe; nearly every lame horse was said to be possessed with it, and it gave scope to that glorious operation of *nerving*, some of the melancholy effects of which Mr Diok has described in a very candid manner. As this disease brought no discredit on the practitioner or his shoeing, it was caught at with avidity, and a college veterinary surgeon was taught to pronounce its existence in a large majority of lame cases, and recommend the operation of *neurotomy*. Whatever was done, all remained a profound secret until the death of the horse, when many circumstances, besides negligence in investigation, would conspire to prevent the real state of the case from being known.

I have examined thousands of contracted feet at the slaughter-house in this metropolis, and employed the men there to preserve for me all that they found in a diseased state at that part; and the result is, that, in a very large majority of contracted feet, no morbid appearances whatever exist in that joint, though in *some* instances of chronic lameness in its worst stages, occasional well-marked cases are seen. These form but a *very* small part indeed of the number that are dead lame; and, after the most sedulous investigation, I can only consider it, in general, as an attendant consequence of contraction, though it, doubtless, *may* exist in feet where but little external alteration is visible, and is then to be ascribed to the influence of the fettering shoe in producing inflammation of the joint. Adhesion of the tendon to the bone, is perhaps the most common occurrence; but a diseased shuttle-bone is in reality a rare thing, and the specimens preserved of it are not numerous. This part, too, is sometimes injured by the prick of a pannel nail, which will bring on the same train of appearances, and such cases have been shown as indubitable instances of navicular disease. It might also be occasioned in another way: the horny sole, which naturally is arched or concave below, with an evident disposition to flatten and expand under the weight with the other parts of the foot,

becomes rigid and preternaturally concave, whence this action is prevented by the shoe and nails. In this hard and fixed state, it offers a solid resistance to the pressure of the coffin-joint from above, instead of yielding to it as it ought to do; this is enough to occasion inflammation of that joint, and its train of bad effects.

I have only one question more to ask the gentlemen who consider navicular disease as the prevailing evil. How are they aware of its existence? What are the diagnostic symptoms (for hitherto no one has described them) by which they know that it is present in a living horse's foot? As dissection alone can furnish proof of the truth or error of their verdict, such evidence is seldom appealed to; but, at the London slaughter-houses, there are too many miserable and hobbling cripples, and I challenge those who maintain this complaint to be more general than contraction, to a trial of their foreknowledge respecting it.

And now, Mr Editor, I must request you to excuse the length and warmth of this communication. I have stated my reasons for believing that this affection is comparatively very rare, that it cannot be predicated with certainty, and that, when it does exist, it is only one of the ruinous effects which result from the unnatural practice of fettering a living elastic organ with an unyielding ring of iron—a proceeding which, familiar as it has become, is still at variance with every principle of anatomy and physiology, and which every day's experience proves to be erroneous. I am, &c.

[We have pleasure in giving insertion to Mr Clark's interesting communication, and are desirous that the question to which it relates, and which has already excited considerable discussion, should be fairly argued. On this account we shall give an opportunity to our friend Mr Dick to make his remarks in our following Number; and we feel assured that both gentlemen will terminate the discussion with the good temper and good feeling with which such questions should be argued. We regretted that Mr Clark's paper was too late in reaching us for insertion in our last number.—EDIT.]

ON THE STOMACH PUMP, AS APPLICABLE TO THE DISEASES OF
DOMESTIC ANIMALS.

AT this season of the year, when cattle feed on green and succulent food, there are perhaps few diseases so common amongst them as that of hoven or inflation in the ruminant. The complicated structure of the stomachs of ruminating animals, renders them peculiarly liable to this disorder, the paunch being a kind of reservoir into which the food is received. In it the food is mixed with the animal fluids; the minute particles are passed onwards through the second into the third stomach, while the coarser parts are again sent up to the mouth to be further comminuted, by undergoing a second process of mastication.

As the paunch is of an immense size in these animals, and as the green food which is taken into it is frequently much overcharged with moisture, and otherwise in a state which renders it liable to fermentation, it often happens, that when the stomach becomes overloaded with this kind of food, the fermentative process goes on with a great degree of rapidity, in consequence of the stomach being, as it were, overpowered and unable to carry on the operation of digestion. This the more readily takes place, because there is a sweetness in the grasses at this season of the year, more especially in the after-math or second crop of clover, which induces the animals feeding on such food, frequently to take an undue quantity. In this fermentation a large quantity of air is generated, by which the stomach becomes so over-distended, that either a rupture of it takes place, or the respiration being interrupted, impedes the action of the diaphragm, and the animal becoming unable to breathe, dies of suffocation in a short time, perhaps in a few minutes.

When such is the often fatal nature of this disease, it becomes a matter of vast importance to know what is to be adopted as a remedy. The means that have hitherto been employed for this purpose are various. The first thing which it is desirable to accomplish, is to restore the tone of the stomach, so that its vital energy may, if possible, overcome the disease.

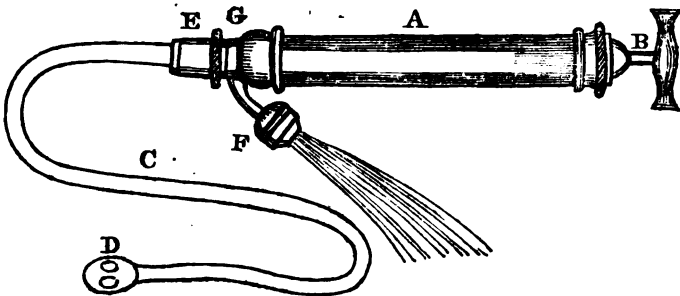
If this cannot be accomplished, a method is adopted of allowing the air to escape, or of removing the accumulated matter from the stomach. To assist the weakened state of the stomach, it is found that any stimulant may be given with benefit ;—any spiritous liquors, as rum, gin, whisky &c. in large doses ; any oily fluid, as olive, linseed, castor, or even train oil, and melted lard or butter, but more especially the essential oils, and of these in particular turpentine ; various stimulants, as the carbonate or water of ammonia, spirits of wine, and nitrous or sulphurous ether ; aromatic seeds, as pepper, mustard, &c. ; resins and gums, as tar and rosin ; various tinctures, as opium ; several acids, as the acetic and muriatic acids ; and alkalies and alkaline earths, in particular lime-water.

But although each of these has occasionally been found to give relief, there are cases which do not yield to such treatment ; and recourse is then had to the introducing a hollow tube through the mouth and œsophagus, and allowing the air to escape through it from the stomach. If this does not succeed, or should the proper instrument not be at hand, an opening is made through the side into the paunch by a pen-knife, or with a trocar and canula, and the air allowed to escape as it is formed. But there are cases in which, from the enormous quantity and solidity of the matter taken into the stomach, even these means all fail, and an incision is then made through the side into the paunch, large enough to allow a person to introduce his hand and extract the contents ; by this means animals are often saved. Such a formidable operation, however, from the manner in which it is performed, and the effects which frequently follow, ought, if possible, to be avoided. As there is a degree of play between the peritoneal surface of the stomach and the peritoneal lining of the parietes or sides of the belly, there is of course, considerable danger of a portion of the matter in the progress of extraction getting into the cavity of the abdomen ; and this, by producing irritation between the two surfaces, causes an inflammation to take place, which frequently destroys the life of the animal. And although these animals are less susceptible of inflammation in this membrane than what might be expected from its sensibility in other animals, still the danger

consequent on such an operation must be considered of sufficient importance to induce us, if possible, to avoid it.

The success which attended the operation of the stomach pump upon the human subject, and the high and deserved esteem in which it was held, called the attention of scientific men to the invention of a similar instrument for the uses of domestic animals ; and the very ingenious one invented by Mr Read of London, for which he obtained a patent, has attained this object in a most satisfactory manner. This pump is calculated in an eminent degree to supersede the necessity of adopting the dangerous and frequently inefficient modes which we have enumerated, and to afford immediate relief to the animal. The pump is chiefly required for withdrawing fluids from the stomach. When the consistency of the mass, however, is such as cannot be operated upon by the pump, liquids can be injected by means of it so as to dilute the mass, and the whole can then be withdrawn.

Mr Robert Rettie, brassfounder in Aberdeen, has transmitted to us an instrument of this kind made by himself, a figure of which is given below. The workmanship is executed in a very superior manner, and the instrument seems perfectly calculated to effect the purposes intended. The chief difference between it and that of Mr Read, consists in the construction of the valves. In Mr Read's, the valves are balls resting in sockets, with space to move when the air is exhausted by the piston. In Mr Rettie's instrument, the valves are half balls, with a space also allowed to play, but retained in their places by gratings.



A is a cylinder of brass in which the piston works.

B is the piston, which is shown drawn partly out.

C is an elastic tube, composed of leather, covered with plaited tharm, and varnished over with a coating of elastic gum. It is about five feet in length, and seven-tenths of an inch in diameter.

D is the end of this elastic tube, a little enlarged, and in the shape of an egg, which is perforated with four small holes, to allow the fluid to be drawn up through the tube. The other end of the elastic tube is attached to a short tube of brass

E, which is fixed by a screw to the cylinder at G. At the point of junction here, is one of the sockets with its semi-globular valve.

F is a bent brass tube, through which the fluid which has been drawn up is ejected by the action of the piston. On the extremity of the tube F, is a male screw of the same size as that on the end of the cylinder. At G, as has been stated, is a socket and half ball; and near the end of the tube at F is a similar socket and half ball. These balls are protected above by a grating, as already mentioned, which allows fluids to pass, but does not allow the half ball to turn over. By drawing the piston out, the valve at F shuts, and the one at G opens, and allows the fluid to pass up through the elastic tube; and by pressing down the piston, the valve at G shuts, and the fluid is ejected through the tube F.

If the action is to be changed and fluid injected into the stomach, the tubes are reversed; the elastic tube is screwed on to the curved pipe F, so that water or other fluid may be drawn into the cylinder at G, and forced by the action of the piston through the bent tube, and along the elastic tube, into the stomach.

The elastic tube may also be used as a rammer for cattle or sheep, in those cases where obstruction arises from a piece of turnip or other substance being lodged in the throat. In this case, the brass end of the tube is put down the throat, and the piece is thus dislodged. In the figure and description which we have given, the instrument is on the large scale, as adapted for cattle and other large animals; but, with smaller tubes, the

same apparatus may be employed, with equal propriety, for sheep and other small animals.

By this invention, Mr Read has conferred a permanent benefit on the breeder and feeder of domestic animals. Such an instrument should be in the hands of every farmer: its cost would be more than repaid in a single operation, by the saving of the life of one of his cattle. Its simplicity, too, is such as to render it capable of being employed by any individual, the only necessary preliminary being that the head of the animal be held in a proper position.

We have hitherto spoken of the utility of this instrument when applied to ruminating animals, as being the most liable to diseases of a nature in which it may be adopted with benefit; but, in diseases of other animals, as the horse, it may often be found of great importance. It is well known that the horse scarce ever vomits; and, when he does so, it is with the greatest difficulty: and, as he is, in some instances, liable to overload his stomach with those kinds of food for which he possesses a great predilection, as oats, bran, wheat, &c., in such cases the stomach is rendered unable to act upon its contents, and death ensues. The stomach-pump will at once afford relief; for, by injecting water so as to dilute the mass, the contents may be pumped out. In such cases, the pump is of great importance, as, in this state of the stomach, medicines have little or no effect.

The instrument may also be employed in diseases of the horse arising from obstruction in the bowels. For this purpose, indeed, it is chiefly recommended by the patentee, although we apprehend it will be more frequently applicable to the class of disorders to which we have referred. It may, however, be used for the administration of clysters; and with greater advantage than the common apparatus, because any quantity may be thrown into the bowels, with the greatest ease, in a few minutes.

ON A HYBRIDAL VARIETY OF THE TURNIP. *By Mr LAWSON,
Seedsman, Edinburgh.*

SINCE the period when Linnæus clearly demonstrated the functions of the anthers and stigmas, numerous additional evidences have been adduced in support of the doctrine of the sexes of plants. The question has long been set at rest, and it would be now, in botany, a heresy of the first order to throw doubts on the theory of impregnation. In fact, that process is performed by the contact of the sexual secretion of the male plant, or of the male organs of the hermaphrodite plant, with the female organs. Upon this hint, botanists have not only observed many of the curious contrivances to which nature has had recourse in rendering sure the process of impregnation, but have let loose their imagination, and invented others for her. It is well known, that, in the animal kingdom, a male and a female of two different species belonging to the same genus, may occasionally, by the force of circumstances, break through the antipathy in which they hold each other, and that a progeny participating of the forms of both parents may result. It might be imagined that in plants such intermixtures should be of more common occurrence. The pollen, wafted by the winds, or conveyed by bees and flies, may be applied to the stigmas of other species as readily as to those of its own. Yet, whether it be that the germens are impregnated by the pollen of their own flower, before any other pollen reaches them, as is undoubtedly the case in most plants, or that there is an organic inaptitude between the pollen and the stigmas of different species, it so happens, that, in a field where there exist multitudes of flowers of numerous species, many closely allied to each other, one cannot, on searching, find a single hybrid. Nevertheless, that hybrids have occasionally been produced, we have abundant evidence. Kölreuter, for example, crossed the *Nicotiana rustica* and *Nicotiana paniculata**. The genera *Brassica*, *Geranium*, *Ra-*

* Within these few months, different species of *Calceolaria* have been successfully crossed at the garden of Lord President Hope at Granton, as described by Professor Graham in the *Edinburgh Philosophical Journal* for July 1830. All the fine new Pears, Apples, and other fruits, of Knight in

nunculus, Saxifraga, and others, are supposed by some, from a few original species to have produced their present multiplicity of forms. To the numerous varieties of Melons, Strawberries, and other cultivated plants, a like origin has been attributed. In the animal kingdom, hybrids produced in the wild state are extremely rare, and when produced in the domestic state, do not continue their mixed form. Hybrids of wild plants are also, as has been stated above, comparatively rare; and, as we see the same forms reappear season after season, we must suppose that if they exist, they are only of ephemeral duration. The case, however, is different in cultivated vegetables, of the crossing of two of which an instance is here related. The crossing here is between the Common Turnip, *Brassica Rapa*, and the Swedish Turnip, which some suppose a distinct species, and others merely a variety of the former.

Though there is a considerable number of varieties of the turnip in cultivation, which are more or less held in esteem according to their supposed qualities, the nature of the soil in which they are to be grown, and other circumstances, those in most general use are the White Globe, the Red-Top Yellow Bullock, the Green-Top Yellow Bullock, and the Swedish. The White Globe grows to the largest size, arrives soonest at maturity, and decays earliest in the season; the Yellows are intermediate between the Globe and the Swedish in their properties; and the Swedish is smallest in size, is latest in arriving at maturity, and often does not decay, till, in the advanced state of the following spring, the plant loses its nutritive properties by pushing out a flower-stem; hence the Swedish is well adapted and chiefly employed for spring feeding. The Swedish Turnip possesses the greatest nutritive powers, and the largest of this variety yields more nourishment in proportion than the middle-sized ones; while the Globe, which attains the greatest bulk, contains the least nutritive matter, and the larger kinds less proportionally than the middling-sized ones of the same variety.

New varieties or hybrids of turnips are obtained by cross-impregnation. Thus, when two varieties are planted alternately

England, and those of the Earl of Dunmore in Scotland, which are nowise behind them, have been produced by dusting the stigma of one kind of blossom (previously deprived of its stamens) with the pollen from another.

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or promiscuously in a plot of ground, when they come into flower the pollen is wafted by the wind indiscriminately over the whole, or carried from one plant to another by insects, when they are in quest of the sweets of the nectary, and applied to the stigmata. But though the means of producing new varieties are simple and easily accomplished, little improvement in this respect has been made in the varieties now generally used in field culture.

In all cases of turnip seeds going through my hands in the course of a season, I keep specimens, which are sown at the proper period in drills in my nursery. This is done for the purpose of examining the progress of the plants and the development of their roots during the season; it also enables me to ascertain the correctness of the different stocks of seeds, and to judge of the superiority of one variety over another. Two years ago, my attention was particularly attracted to the produce of the sample of a hybrid or doubly-impregnated sort, the seed of which I received from Mr Robert Dale, a very intelligent farmer at Libberton West Mains, near Edinburgh. It attracted my attention, first, on account of its early growth and maturation; secondly, its fine shape, as will be seen in the figure; thirdly, by the great size to which it attained, in comparison with any sort under similar treatment; and, lastly, by its standing the winter equally well with any other turnip except the Swedish.



And conceiving that the great desideratum in the selection of a proper variety of the turnip, is to obtain the greatest possible

weight on a given space and at a given expense of manure, this variety seems to be more adapted to this end than any other sort hitherto introduced.

The manner in which it was obtained by Mr Dale, was the following: In the year 1822 or 1823, he got a few ounces of seed of a new hybrid turnip from James Shireff, Esq. of Baslderidge in Berwickshire. This, Mr Dale sowed, and he found the produce to resemble the Swedish in shape, but it had too few of the superior properties of that variety. He, therefore, picked out such as had most of the yellow appearance, and planted them along with some of the best Swedish which he could find. This he continued doing for four successive years; and, since that period, he has selected the best roots of the doubly impregnated kind which he could find for raising seed, till they have attained the quality which they now possess.

The manner in which this variety has been obtained, I am aware, is not according to the nice rules which horticulturists would have recommended to be adopted, because, as the hybrids were always planted along with the Swedish for producing seed, and the seed collected promiscuously, that part of the seed which was produced from the Swedish would be much more nearly allied to that variety than the seed of the hybrids. But in this, as in many other instances of improving plants, the point is often attained more from accidental causes than from the adoption of the rules laid down by scientific cultivators. And, although all the hybrids may not stand in the same relation to the primitive root, the circumstance of the raising the seed being now performed solely by the hybrids themselves, without the assistance as formerly, of the Swedish, will always have the tendency to assist in modifying and correcting any irregularity that may exist. Indeed, judging from the appearance of the present stock, there is nothing which indicates any important consequences to this irregularity in the manner of obtaining the hybrids.

To show in what respect this hybrid is superior to, or differs from, the turnips at present in cultivation, I shall give a list of the kinds sown for different purposes, with a comparison of their properties with that of the hybrid in question. The turnips in general cultivation are the following:

For early use,

White Globe,
White Tankard,
Pomeranian Globe,
Hungarian Globe,

} The hybrid is equal in size to any of these, is closer in the texture, and is as early.

To succeed the above,

Red Norfolk,
Green Norfolk,
White Norfolk,
Green Globe,
Red Tankard,
Yellow Globe,
Bullock's heart,

} The hybrid is superior in size, in texture, and in shape, to all of these.

Still to follow these,

Purple-top Yellow Bullock,
Green-top ditto,
Tankard Yellow

} The hybrid is superior in size, and, in so far as it has been tried, it stands the winter as well.

For late use,

Purple-top Swedish,
Green-top Swedish.

} The hybrid is superior in size, but shoots to flower earlier in spring, and is not so hardy.

This hybrid, or doubly-impregnated turnip, therefore, appears to possess properties in general, superior to those varieties which have been enumerated above. It is equal to, or surpasses the yellow, and the other sorts above it, and is only excelled by the Swedish, in the latter being more hardy and later in spring in running to a flower-stem. It is now generally known by the name of Dale's Turnip, or Dale's Hybrid.

The facts which I have stated will, I trust, be considered in this respect interesting, that they show an easy method by which intelligent agriculturists may increase or improve the varieties of the plants which they cultivate.

ON THE USES OF SALT AS A CONDIMENT FOR DOMESTIC
ANIMALS.

Testimonies in favour of Salt as a Manure, and a Condiment for Horse, Cow, and Sheep. With Testimonies of its vast importance in the Arts, Manufactures, and in the Fisheries; accompanied by Testimonies in favour of Agriculture. By the Rev. B. DACRE, A. L. S. 1825.

ALTHOUGH the nature of the change which food undergoes in being assimilated with the animal body, in the process of digestion or sanguification, has as yet baffled the research of physiologists, the effects which are produced upon the food in the course of this change can be easily described. The food, after being masticated, and receiving the fluid called saliva, which is poured out from the glands around the mouth, is reduced to a pulpy mass, and conveyed to the stomach. Here it is acted upon by a powerful solvent, the gastric juice, which attacks the food, of whatever kind, and reduces it to a pultaceous mass called Chyme. In this state it enters the intestinal canal, continued from the stomach; and, as it there gradually passes on, it receives a mixture of bile and pancreatic juice poured out from the liver and pancreas by their ducts; after which a change and separation of parts take place, and the pure nutriment of the body appears as a milky fluid floating among refuse. This milky fluid, called Chyle, is taken up all along the canal by the numerous absorbent mouths of the vessels called Lacteals, and is then carried to the thoracic duct, and by it into the bloodvessels, and from them to the heart; thence, passing through the lungs, it is supposed to absorb oxygen from the air, and it is then converted into blood. In this state it traverses the whole body by the arteries and veins, supplying the waste, and giving out as required, skin, tendon, bone, muscle, and the various secretions. That remnant of the food which is not converted into chyle, and which the absorbents refuse, continues its journey onwards to be discharged as useless.

In that vast range of vegetable and animal matter which

forms the food of animals, there are various degrees in the facility with which these undergo digestion. Some food is rich, or highly concentrated, and greatly superior to other kinds in its nutritive properties; but, in proportion as food is highly concentrated, it is very generally so much the more indigestible. Nay, it would appear that, with a vigorous digestion, under favourable circumstances, it is the quantity, rather than the quality of food, which is the most requisite; for graminivorous animals become fat in a short time on turnips and grass, substances very low in the scale of nutritious aliments. Man, possessing at his command the whole range of animal and vegetable food, is enabled to take such varieties and blend them so together, or use such correctives as may co-operate and tend to assist each other. But graminivorous animals, to which our attention is at present especially directed, have not such varieties of food at command, but are chiefly confined to grasses, herbs, and a few cultivated roots.

There is a class of substances which is highly important both to man and the lower animals, in promoting the proper action of digestion, called condiments; these are arranged under two divisions—Spices and Salts. The bitter and aromatic principle is eagerly sought after and relished by some animals. And that this is to answer some essential purpose in the animal economy, is beyond a doubt; for the vital functions of animals, confined to one species of food, which probably have very little or neither of these condiments, wear out comparatively early. Man lives longer than other animals, chiefly, it is contended by some physiologists, from the wide range of food which he enjoys, and from the various improvements upon that food, and the correctives which he takes with it. But in his ruder state this is often not the case;—the Hindoos, for example, who feed solely on rice, are a feeble and unenergetic race; when attacked with disease, they soon sink under it, and seldom arrive at the age of 60. Graminivorous animals, too, delight in a change of pastures, and are fond of blending a variety of herbs and grasses in their feeding. Of the condiments, salt is the most common, the easiest procured, and of the greatest importance.

Common salt, or the muriate of soda, is obtained by evapora-

tion from sea water, brine springs, salt lakes and rivers, and from native rock-salt. The sea affords an inexhaustible source for the manufacture of this material. About one-thirtieth part of the whole waters of the ocean is common salt. And if, according to La Place, we assume the average depth of the ocean to be ten miles, were its waters evaporated, it would form a mass of salt sufficient to cover all the present dry land of the globe, to the depth of 2000 feet. Salt springs are also spread very extensively over the world. Native rock-salt, or fossil-salt, is found in every quarter of the globe. It is found in Cheshire in England; in several departments in France; at various places in Spain and Germany; in Hungary and Poland, Turkey, Africa, and South America; the whole island of Ormuz in the Persian Gulf, it is said, is of rock-salt. Salt is also found in incrustations upon the ground, in various warm countries, where the heat of the sun produces rapid evaporation; as in the plains and prairies in America, the deserts of Africa, and other places. Such is the general diffusion of this highly useful substance. Indeed, it seems to be a law in nature, which admits of almost no exceptions, that those things which are most required for the comfort, happiness, or sustenance of man, are the most accessible, and distributed in the greatest profusion over the globe.

Salt is one of the constant constituents of the blood, and exists there always in the same quantity; for which reason it may be inferred, that it must serve some useful purpose in the animal economy. There is no set of people, barbarous or refined, who do not relish a certain quantity of salt among their food; and the extraordinary efforts which some animals make to obtain it, as we shall afterwards have occasion to notice, would lead us to conclude that it is required for some important purpose. A certain proportion of it amongst food seems absolutely necessary for the health of the animal system. That it is so, indeed, is proved by the following account, given by Lord Somerville in his Address to the Board of Agriculture, of a punishment which once existed in Holland. "The ancient laws of that country," observes his Lordship, "ordained men to be kept on bread alone, unmixed with salt, as the severest punishment that could be inflicted upon them in their moist climate.

The effect was horrible; these wretched criminals are said to have been devoured by worms engendered in their own stomachs."

In Spain, where the finest wool in the world is produced, a certain quantity of salt is given to the sheep, and from which it has been inferred by some the superiority of the wool arises. The *Mesta*, which meets every year, is a society which originated in the year 1350 by an association of the proprietors of land, after that country was devastated by the plague, consisting of a president, who is a counsellor of state, and the members, who are owners of the numerous flocks. In the temperate seasons of winter and spring, the migrating flocks remain in the provinces of Estremadura, Andalusia, the southern parts of Leon, and Old and New Castile, until the increasing heats of April and May scorch up the grass, and render the pastures scanty; they then migrate to the mountains and elevated country of Leon, Old and New Castile, Navarre, and Biscay, which afford them abundance of rich grass; and they remain there till the frosts of September begin to damage the herbage. It is during the hot months of summer, when the sheep are on the mountains, that they receive a regular supply of salt; but the manner in which it is given to them we shall state more in detail afterwards. The number of sheep in Spain is estimated at about 18,000,000, of which about 8,000,000 are migratory, and the remainder are stationary. For each 1000 sheep there are five shepherds and four dogs; there will therefore be in Spain 90,000 shepherds and 72,000 dogs employed in taking care of the sheep; besides, there are three additional shepherds for each 1000 sheep, employed in the lambing season, and when the sheep are migrating.

We have gone thus much into detail in regard to the Spanish sheep, in consequence of an opinion pretty generally prevailing, that they were originally derived from our British breeds, and that the fineness of their wool arises from the animals having the free use of salt. This, coupled with the superior attention bestowed on them, where the fleece is the sole object of care, the carcass being only eat by the shepherds and the poor, may have a considerable influence in promoting the fineness of the wool. But we think the question regarding their origin has been set at rest, by Dr Parry, in his learned communication to the Board

of Agriculture. He has there come to the conclusion that they were originally derived from Italy, and not from Britain.

The disposition that animals naturally possess for salt, forms an important subject of inquiry. Of these, the most interesting and the truest, because it is unmodified by the caprice of domestication, is that of wild animals.

All the quadrupeds of North America, observes a writer in an early Number of the *Quarterly Review*, both wild and tame, native and imported, have a sort of instinctive passion for salt; and, as if nature had intended that this passion should not be without its object, there are interspersed all over the continent springs of brine and earthy rocks, impregnated with saline matter. To these the elk, the bear, the deer, and the buffalo, at whatever distance their pasture-grounds may be, periodically repair; and, laying aside their natural antipathies, drink and bathe in the springs, or lick the salt rocks and earth impregnated with salt, many of which, in the course of ages, have been excavated by their tongues into the most fantastical shapes. It may appear a little incredible, that excavations of from eight to ten feet deep, and of such large extent, should have been made by the soil having been licked up and carried away in the stomachs of animals. But when we reflect that such a vast number of wild animals exist in these regions of magnificent forests and savannahs, our scepticism may cease. Captain Clarke* states, that the Yellowstone, a little below the place where it issues from the Rocky Mountains, is a bold, deep, and rapid stream. The buffaloes were there in such numbers, that a herd of them one day crossing the river, stopt the canoes for an hour in which he was to cross it. The river, including an island over which they passed, was a mile in width, and the herd stretched as thick as they could swim from one side to another during the whole of that time. He also observes, that these animals seemed to prefer pools which were so strongly impregnated with salt as to be unfit for the use of man, to the water of the river.

The plains of North America, to the west of the Mississippi,

* Travels to the Source of the Missouri River, &c. By Captains Lewis and Clarke.

are now almost the only resort of that prodigious population of buffaloes which was formerly diffused over the whole interior. Between the Mississippi and the Apalachian ridge, they are nearly extirpated. When the Anglo-Americans first penetrated the woods of these vast regions, it was chiefly along the tracks which were formed by the buffaloes in their annual visits to the salt-licks. The paths thus formed by the infallibility of instinct, extending often for 200 miles, are lined out with mathematical exactness, going directly to their object by the shortest possible way, and never deviating but to avoid impassable obstructions. So true is this, that a great part of the roads which now traverse and connect extensive districts in the back settlements, were originally nothing more than buffalo tracks *.

The country near Buenos Ayres is fertile, but much to the west of the Great River is impregnated with salt and nitre. The Pampas, those extensive plains which extend to the south, unlike the character of America in general, are destitute of wood; not a tree or shrub is to be seen which could be converted to any useful purpose. But they are covered with a tall and luxuriant herbage, which affords subsistence to innumerable herds of cattle and horses. And the whole country of Patagonia southward, including the Great Salt Desert, to the Straits of Magellan, possesses much of the character which we have described above; yet, much of this seemingly barren country produces good pastures where numerous droves of wild oxen and horses are found in every district. Fresh water is scarcely to be got, either on the coast or in the country; but the dogs, horses, and other animals, have to drink salt-water. And, with all the disadvantages of an inhospitable climate, the absence of woods for shelter, and the presence of salt-waters, the numbers of wild oxen and horses are amazing; and the natives, who are a predatory race, are the tallest, and perhaps the handsomest people on the whole globe.

The great extent of deserts in Persia is saline rather than sandy. In consequence of the political change and calamities to which that empire has been subject, a great part of it is now abandoned to pasture, and tenanted by wandering shepherds,

* Quarterly Review.

these having descended from the mountains to occupy the place of the husbandman, who, ruined by oppression and war, has deserted the culture of his fields; and those artificial canals, by which the fertility of the soil was maintained, are now neglected, by which territories formerly distinguished for their fertility are entirely unfit for culture. The salt with which the soil and waters are every where impregnated has often accumulated and formed a kind of crust upon the surface, producing only soda and other saline plants; all the lakes and considerable collections of water soon acquire the same character, and scarcely anywhere does the husbandman enjoy a moment's tranquil security from the forays of the wandering freebooters and barbarous chiefs. The horses of Persia are esteemed the finest and handsomest of any in the East, and are as powerful and serviceable, though not so fleet, as those of Arabia. There is an excellent breed of mules; and the camel and ass are used in travelling. Sheep, of the long-tailed species, are reared in vast numbers by the wandering tribes, and the wool which they produce forms most extensive manufactures. The goats of Kerman yield a valuable wool, similar, though inferior to that of Thibet. Those unrivalled Turkey carpets, which obtain their name from the place where they are imported, are wrought by the females of these Persian tribes.

In Asia Minor, there are vast plains which produce only saline plants or wormwood and sage. Often by the side of dreary salt marshes, there are other plains less moist, which derive their verdure entirely from two kinds of broom; yet asses and sheep are found, in considerable numbers, feeding in these barren regions.

The desert of Mesopotamia in all its gloomy uniformity, presents saline plants covering detached spots at great distances, in the burning sand. Here the wormwood, like the heath in Europe, takes possession of immense tracts to the exclusion of every other plant. Even amidst this picture of sameness and sterility, flocks of antelopes are found to exist. On the eastern coast of the Caspian Sea, is a sandy and rocky country, labouring under a deficiency of water, and that which is to be had is brackish; and here sheep and camels are pretty generally diffused. Between the lake of Aral and the Caspian Sea, there

is an infinite number of brackish marshes ; and through the whole of the steppe of Kirguis salt lakes are of frequent occurrence. The salt lake of Indereek, near the river Ural or Yaik, is a sheet of water, fifty miles in circumference, so impregnated with salt as to give the surface a white colour. Stormy winds arise here which become impregnated with saline particles, and are wafted inland. Though this country presents in general sandy downs, and mountains interspersed with hills of a clayey texture, yet it is said that some individuals of the middle horde, had 10,000 horses, 300 camels, 300 or 400 sheep, and more than 2000 goats, besides dromedaries, and they are supposed to take 150,000 sheep every year to Orenburg. In the province of Seistan in Afghanistan, is the lake of Durra, of which the waters are brackish, and the miry banks of which are frequented by herds of oxen and camels.

In Hungary, immense deposits of rock-salt are found on the Carpathian Mountains, and in the plains a vast number of salt springs, or springs impregnated with nitre, are interspersed ; from the Carpathian Mountains to the banks of the Drave and Danube, lakes, or rather marshes, which contain carbonate of soda, are scattered over all the plains. Fossil-salt is also found in great abundance in Transylvania. And in Hungary, we are informed, the largest oxen in Europe are bred ; they are of the strongest race, and distinguished by the length of their horns and their grey colour. It is supposed to contain about 2,394,000 ; and no fewer than 150,000 are exported every year to Austria and Italy *.

The argali or wild sheep, the flesh of which, and particularly the fat, is esteemed by the Kamtschadales as food fit for the gods, is found in all the alpine regions of the centre of Asia, in Kamtschatka, and on the highest mountains of Barbary, Corsica, and Greece. It is very fond of salt, and will excavate the earth to a considerable depth in order to obtain it. The Scythian antelope frequents the open and dreary deserts of the continent, about Mount Caucasus, the Caspian Sea, and in Siberia. It feeds chiefly on salt, and the plants that grow near salt springs. The chamois, which is chiefly found on the Alps and the Pyrenees, feeds on the most delicate herbage it can find, and is very fond of salt †.

* Malte-Brun's Geography.

† Bingley's Animal Biography.

From these instances which have been given, it will be seen that quadrupeds, in a wild state, possess an instinctive desire for salt; and that in those places where salt and salt-water exist or predominate, animals are found in equal, if not in greater numbers than, under similar circumstances, where these do not exist. Such animals, too, are generally superior to those not so situated.

Its usefulness to domestic animals, seems to have attracted notice at an early period. Virgil directs salt herbage to be given to cows, to produce more milk. And Pliny recommends the same application of salt pastures both for giving milk and for making cheese; he also recommends the giving of it to sheep. We learn from Columella, that salt was used as grateful and soothing to oxen when training for the yoke. After minute details in regard to binding the ropes round their horns, rubbing their nostrils, handling their backs, &c., he says "Take hold of his tongue, rub his palate over with salt, put down his throat cakes of a pound weight, dipped in melted fat salted, and pour into him a sectary of wine with a horn; by this soothing usage, he will in three days be accustomed to his keeper, and on the fourth receive the yoke *." In North America, salt is given to horses, cows, and hogs, to keep them tame. In our own country it is known to every farmer, that cattle fed in courts, are so fond of salt, that they readily eat the wet litter from the horses, when thrown into the dung court, it possessing the salt of urine.

Many of the small islands on the west of Scotland, as the islet of Copay in Harris, the Flannan Isles off the west coast of Lewis, and the Shiant Isles between Lewis and Skye, possess in a remarkable degree the power of fattening cattle and sheep. These rocky islets are destitute of spring water, which, it might be presumed, would be injurious to cattle feeding on them, but is not really so. And the superiority of this kind of pastures seems to be inferred, and we conceive most justly, by Mr Macgillivray, the accomplished naturalist to whom we are indebted for many interesting essays on the vegetable productions of North Britain, to arise from the quantity of salt with which the herbage is impregnated by the spray of the sea being dashed over it in stormy weather †.

* Dickson's Husbandry of the Ancients. † See page 168 of the present vol.

But we shall now revert to the work which we have noted above. In it are collected together the opinions of the greater number of our eminent agricultural writers on the uses of salt as a condiment for animals; and from the names which we shall have occasion to quote, the greater part of which is taken from the work in question, our readers will be able to appreciate the importance and weight of that evidence which we now lay before them.

That the greater number of quadrupeds, whether wild or domesticated, do possess a desire to obtain salted food, or to lick salt, as a matter of choice, cannot, we presume, be questioned; and that the obtaining such food either when licked in a dry state, or when obtained by being mixed with the food, as with hay, or in salt marshes, is attended with beneficial effects upon the animal, is equally unquestionable. In the case of a field, one half of which had been manured with salt, the cattle eat the pasturage of the part so treated quite bare, before they touched the other part of the field. To salt marshes, indeed, lame or diseased animals are sent as to a hospital. The effect, we are told, is astonishing; they soon become purged of their disease, and get fat. The giving the animal salt to lick, or the depasturing on salt marshes, promotes the health of the animals, accelerates their growth, softens their skin, and gives them a soft and shining hair or wool*.

In Bengal, and the Upper provinces, a daily supply of salt is given to the shepherd to feed the sheep, and the mutton fed in this way is finer than any other killed. The sheep on the coast of Coromandel, we are informed, are much inferior when not so treated. In Spain, Portugal, and North America, some dry salt is placed on stones in the sheep pastures, and it is surprising with what eagerness these animals resort, each in his turn, to the stones and take a little of it.

Salt is a substance not convertible into nutriment, but is a strong stimulant to the animal fibre. Though it possesses no nourishing properties of itself, therefore, yet it acts in a power-

* Dr Anderson's *Recreations in Agriculture*; Lord Somerville's *Communications to the Board of Agriculture*; Sir John Sinclair's *Husbandry of Scotland*; Dr Brownrigg's *Art of Salt*; Mr Curwen; Mr Young; Dr Holland's *Agricultural Survey of Cheshire*; Mr Hollinshead's *Hints to Farmers and Country Gentlemen*; and to these could be added various other authorities.

ful manner on the system in fitting the food for being absorbed by the vessels and converted into nourishment. That there are different states of the animal system for converting food into nourishment, both in man and the lower animals, is very obvious; for it is sometimes seen that one man or other animal will devour double the quantity of food that another of the same species will do, and yet the one that consumes the least will increase the most in fatness. This evidently arises from the state of the system, in the latter case, adapting the small quantity of food which it receives to the immediate nourishment of the body; in the other case, the large quantity received, not being rendered suitable for being taken up by the absorbent vessels, the greater part is discharged as refuse.

In the first volume of the *Memoirs of the Royal Academy of Sciences at Paris*, is a paper on this subject, quoted in the *Annals of Agriculture*. It is there contended, that salt given with the food of animals augments the nourishment of that food; and this the writer supports by the following facts:—"In the jurisdiction of Arles," says he, "in the county of Provence, there is a district called the Crau, extending in length about six leagues, and breadth about three, the whole surface of which is covered with small rough stones, and not a tree or bush is to be seen in the whole district, except here and there upon the borders; yet on this spot, so seemingly sterile, by the free use of salt, more numerous flocks of sheep are bred and reared than upon any other common of equal extent throughout the whole kingdom; and what is not less remarkable, the sheep are healthier, hardier, and endure the severity of the winter with less loss, though they have fewer sheep-cots for covering, than those fed and bred in more copious pastures, and that have, besides, the advantage of more convenient shelter. Add to this, that the wool of the flocks bred and brought up in the Crau, is not only the finest in the whole country, but bears the highest price of any in France. From which it is concluded; that it is to the unlimited use of salt that these surprising effects are to be ascribed; for it frequently happens that the Crau is so burnt up in the summer, that the poor animals are forced to turn up the very stones to come at the few blades of grass that grow round them, and yet none perish for want of

food. Let every excellence, therefore, that can reasonably be supposed inherent in the herbage be allowed to it, yet the quantity of it is so small, that without the abundant use of salt, a fourth part of the sheep kept on the Crau could not subsist on it."

Lord Somerville was amongst the earliest who introduced the practice into England of giving salt to sheep, a distinct account of which he has given in a communication to the Board of Agriculture. He purchased 200 Merino sheep in Spain, at about L. 22, 10s. each, which he brought to England; and, as they had been accustomed to receive salt in Spain, he continued the practice when he brought them to this country; and he also extended the practice to his other sheep. His Lordship some years afterwards removed from the rich vale of Taunton, in Somersetshire, to an estate which he had purchased in Surrey; and this being on a dry light sandy soil, he did not think it necessary to go on at such a large expense, as salt then was so heavily taxed; but for some years afterwards he lost many of his young sheep, which he was afterwards inclined to think might have been saved, had he continued as before to give them salt; and he afterwards reverted to his former mode of giving his sheep their regular supply of this useful ingredient. He says, that sheep require more salt in the autumn and spring months, when the dews are heavier than in summer or winter; and that they consumed at the rate of one ton for every thousand sheep annually. Twice a-week was usually found sufficient, but in particular cases it was given them thrice. His method of giving it to the sheep was the same as that adopted in Spain. This we find very distinctly described in the Travels of Mr John Talbot Dillon through that country. "In Spain," says Mr Dillon, "the first care of the shepherd, when he comes to the spot where his sheep are to spend the summer, is to give them as much salt as they will eat; for this purpose he is provided with twenty-five quintals of salt for every thousand sheep, which is consumed in less than five months, but they eat none on their journey or in winter. The method of giving it them is as follows:—The shepherd places fifty or sixty flat stones, about five steps distant from each other; he strews salt upon each stone, then leads his flocks slowly through the stones, and every sheep

eat at pleasure. This is frequently repeated, observing not to let them eat, on those days, in any spot where there is limestone. When they have eaten the salt, they are led to some argillaceous spots, when, from the craving they have acquired, they devour every thing they meet with, and return again to the salt with redoubled ardour."

Mr Curwen recommends very strongly the giving of salt to sheep, and seems to have improved upon the practice then prevalent. He recommends 4 oz. per week to each sheep, given at twice, if feeding on dry pastures; but, when feeding on turnips, or other succulent food, he says it should be given them without stint. The quantity usually given by him, which was more than double what was given by Lord Somerville, amounted to about 9 lb. each sheep per annum. "The practice of giving salt to sheep," observes Mr Arthur Young, "is proper; and it is remarkable that this custom should be common management in almost every country in the world, England excepted. It certainly tends to keep any flock healthy. If land be wet or moist, or otherwise unfavourable, the evil may be considerably remedied by the practice of giving salt. Sheep should have as much salt as they will eat."

Lord Somerville, Mr Curwen, and others, recommend the use of salt as a preservative against the injurious effects of moist or wet situations, where sheep may be required to graze. Without the free use of salt, they say, sheep cannot be kept on strong wet retentive soils, without great risk of loss; but when applied, it renders such pastures perfectly sound, and flocks may be kept on lands, which, without the use of it, it would not be prudent to hazard them. When turnips in the early season are stocked with sheep, and the greens are rank and strong, many sheep die suddenly, more especially young two-toothed sheep. The disorder is a pent up wind, occasioned by excess of fermentation in the stomach; here salted hay and salt are devoured with a greediness that denotes their salutary effect. In the spring, when Mr Curwen's flock was attacked with an inflammatory disorder, he gave them a considerable quantity of salt, and the disorder was speedily stopped by it. In Sir John Sinclair's *Agricultural State of the Netherlands*, he says, that at Mr Moselman's farm at Chenoi, beyond Wavre, he found, that salt

was used for sheep, and that by allowing them to lick it, the rot was effectually cured. Mr Bracebridge of Walton-on-Thames, was induced to drench some sheep, which were affected with the rot, night and morning, with strong brine, after which he did not lose one; they became fat, and the meat was as fine and good as if the animals had never been affected. In strong pastures, observes Lord Somerville, when seasons are wet, the rot often spreads destruction over whole tracts of country; here salt must be beneficial. It is supposed, and with great truth, to correct acidity in the stomach, a disorder common to sheep even in Spain, but of a much more serious nature in the damp climate of Great Britain; more particularly, when stocked on green moist food, such as turnips, vetches, and young clover. In Sweden, in Saxony, in Silesia, and in France, salt is given to sheep. They require it most when they are languid, and out of order, which happens in fogs, in heavy rains, and snow.

Mr Charles Adams, a writer in the *Farmer's Journal*, has given salt to sheep and lambs as an antidote for certain diseases. "I have for the last ten years and more," says he, "given salt to sheep in the following proportions, in all cases of diarrhoea, with the best possible success:—Two drachms (apothecaries weight) of dry salt for a lamb of nine months old, and that quantity increased to three and a-half drachms for a large and full grown sheep, and in the same ratio for the intermediate ages. The mode I adopt is to introduce the specified quantity into the mouth of the sheep with a spoon, withdrawing the spoon, and closing the mouth. In a few seconds, the salt dissolves in the saliva, and the sheep readily swallows it. I consider water not only inconvenient, but improper, as a superabundance of it was, in my opinion, the original cause of the disease. I have seldom found a repetition of the above dose necessary; but if *one* should not prove effectual, there can be no objection to repeating it, every other day, till the desired effect is produced."

Salt, given to cattle and horses, is attended with equally beneficial effects as when given to sheep, and the practice is as widely extended. Besides being used in feeding and for keep-

ing cattle and horses fresh and in good condition, it is also given to cows, to increase the quantity of their milk.

It is stated by the Royal Society of Medicine at Paris, that, in the years 1777 and 1778, the mortality had increased in their fields, since the augmentation in the price of salt had obliged the farmers to give it more sparingly to their cattle. In the district of Champsaur, and the adjacent countries, they were in the habit of giving every ox and cow four ounces of salt every eight days. When this practice is neglected, the animals eat less; they lose their spirits, their hair rises, they go licking in their stalls the bottom of the walls where the saltpetre is formed, they grow lean, become barren, and disease ensues. The fattening properties of salt, when given to cattle, is also advocated in a paper in the Memoirs of the Royal Academy of Sciences at Paris. It is there stated that salt, when given with the food of cattle, augments the nourishment of that food; and that, in proportion to the quantity of salt eaten by cattle, the effects of that augmentation will be perceivable; and further, that no ill consequence will follow from excess of salt eaten by cattle, even though it should be given them without stint.

"The Odonargo," says a traveller in America, "is a fine lake of brackish water, surrounded by springs. All the animals of these parts have a great fondness for salt. The cattle of farmers, who give this substance to their stock, prove superior in value by twenty-five per cent., to such as are not supplied with an article so essential not only to their general improvement, but to their health." A North American Planter, in the Museum Rusticum, says, that, in North America, horses are as fond of salt as cattle; and that if they were ever so wild, they will much sooner come for a handful of salt than for any kind of corn; and to the practice of giving salt to their cattle is generally ascribed that freshness and freeness from disease in which they contend the American cattle so much surpass those of England. Mr Birkbeck, in his Notes on a Journey in America, says, that the horses there are kept in high condition, even when travelling at the rate of forty-five miles per day, on long journeys, by getting from four to five gallons of oats per day; besides hay, with a good handful of salt, about twice a-week.

In Germany, it is stated on the authority of Count Rumford,

that salt is universally given to oxen and cows in a fattening state, and that their fattening powers are in proportion to the quantity given. And in Sir John Sinclair's *Agricultural State of the Netherlands*, we are informed, that at Mr Mosselman's farm of Chenoi, beyond Wavre, to which we have already referred, salt is given both to cattle and horses; that the cattle, to whom lumps of it were given to be licked, were thereby protected from infectious disorders; and that the cows being thus rendered more healthy, and being induced to take a greater quantity of liquid, gave more milk. And, further, that a small quantity pounded was found very beneficial to horses, when new oats were given them, if the oats were at all moist.

At the sales in Bengal, it is stated by a Bengal officer, bullocks sixteen years of age, rendered unfit for service, are brought up by the officers in the month of June for feeding. These cattle are generally fed with grain and a species of vetch, and a daily supply of salt and chaff. By the beginning of December, he adds, these old bullocks are as fine beef as can be produced at the annual shows in Smithfield. On the fattening of bullocks, it is stated by M. Juge, in the *Annals of Agriculture*, that amongst all these animals there are some naturally better disposed to fatten than others; and that care and attention are paid to giving a plentiful supply of food to those that are least inclined to fatten, in order to sell them at the same time, and to give them an equality with others to facilitate the sale; for this purpose salt is added to their common food. This ingredient, of which they are very fond, gives them an appetite, excites thirst, and facilitates digestion. There are various methods of administering it, such as hanging it up in a bag between two bullocks, who lick it after feeding, or melting it in the white water, the paste, or in the chesnut-bread, or, in short, by giving them some handfuls of it, either on a board, or at the bottom of the troughs when empty.

In a communication by Sir Thomas Bernard, it is stated, that it had been a practice to lay a lump of rock-salt in the manger of each of four horses every spring and autumn for several years, which they eagerly licked, and the effect was, that three of the four horses had been in good health, with very little exception, for fourteen years. And, from the same autho-

rity, we have the following account of the effects of salt given to a horse. "In visiting Mr Farley's salt-works at Droitwich, in August 1817," observes Sir Thomas, in a letter to the Right Honourable N. Vansittart, "I was struck with the appearance of a small black horse, that worked the machine for raising the brine. He was in very good condition, and his coat was like the finest black satin. I asked the old man who had the care of him, what made the horse so sleek and plump? His answer was, that he had regularly given him a little salt in his chaff three days in the week, about four ounces each of the three days; or, if he was not very stout, then sometimes a little more; but that in general the horse was very well, and did his work well. He said he did not give him the whole four ounces at once, but at several times, about a table-spoonful each time. The horse had been purchased by Mr Fairley about four years ago, being then about twenty years old, and his health and appearance, though he had constant work, had been since very much improved; the salt, he added, had made him eat his food and work better. A farmer, who was present, observed that he usually gave his horses a little salt in their grains, and found that it did them good; and also that he gave it them as a cure for the bots."

Sir Thomas Bernard also says, that salt is given to animals when greater exertion is required of them; that some gentlemen, when they want extraordinary exertion from their horses, always give them a little salt; and this, he says, is analogous to the practice in the east, where the camels are allowed salt during the passage of the caravans over the desert to Alexandria, as a support in the extreme fatigue they undergo.

Mr Varley, in his *Farmer's Guide*, says, that a poor torn-down horse put into a salt-marsh, is purged and cleared of every disorder, and immediately becomes fat. In Cheshire, a practice exists of giving a little salt to cows when they are falling off in their milk, and it is said always to be attended with good effect.

Mr Curwen, in his evidence before a Select Committee of the House of Commons on the salt laws, of which committee he was a member, in a communication to the *Farmer's Journal*, and in other places, has treated of the uses of salt to cattle and horses. In his evidence before the committee, he observes:

"Salt has been administered to my cattle and horses with great advantage, their condition is greatly improved, and their health has been invariably good, and which I attribute greatly to the use of salt given with steamed chaff; that is, the husk of the corn, which was of little or no value prior to its being given, dissolved in the quantity of four ounces, in about two stones of that steamed chaff per day; this, of course, makes a considerable saving in the quantity of green food, which would otherwise be required. Having been a considerable corn-farmer, I have a sufficiency of wheat and oat chaff for the supply, which is about two stones each per day. It is prepared by the application of steam; for food of this kind is of so little value, that cattle would hardly be induced to take it without oil-cake or ground grain; but, by the application of salt, it is taken exceedingly well, with very little loss. The first visible effect of the salt was in its freeing the milk and butter from all taste of the turnip." He latterly gave six ounces of salt per day to his work-horses—four with steamed potatoes, two with steamed chaff. The following table shows the quantity per day, given at twice, which he commenced with in April 1818, and to which it had been beneficially increased in December 1819.

	April 1818,	Dec. 1819.
	oz.	oz.
Horses, . . .	4	increased to 6
Milch-Cows, . .	4	----- 4
Feeding Oxen, .	4	increased to 6
Yearlings, . .	2	increased to 3
Calves, . . .	1	----- 1

Mr Curwen adds, "Salt prevents the grease. I have given a pound a-day, with advantage, to horses that have been excessively greased. It is pleasant to say, that numerous trials by my neighbours in Cumberland wholly corroborate my statements of the usefulness of salt in feeding stock. The benefit of salt in feeding all kinds of stock, and its value as an alterative medicine, is established, on the concurrent testimony of numbers, beyond all possibility of doubt." And, in the year 1822, he states, that before he commenced giving his cattle salt, his farrier's bill for medicine averaged L. 58 per annum; and that

since the use of salt, he has never paid in any one year five shillings.

Besides giving salt to animals in the different ways that we have mentioned, it may be given to them with great benefit by being mixed with hay or straw. And this seems to have been an ancient practice. Cato says, "When you lay up straw, put that kind in which there is the greatest mixture of grass under cover, and sprinkle it with salt, then give it for hay." Pliny also says, "If the palea is deficient, the straw from which the corn is reaped is broken for this purpose. It is sooner cut down than otherwise it would be, lies a considerable time sprinkled with brine, then, when dried, is rolled up in bundles, and so given to the oxen for hay."

Of the modern agricultural writers, there are a vast number who treat of the application of salt to hay, and all concur in the great advantages to animals fed on hay so treated*. A North American planter, in the *Museum Rusticum*, says, "There is one very advantageous practice we have, which I cannot enough recommend to the notice of the farmers here in England: it is mixing salt with our hay-ricks when we stack it, which we call brining. Just before I left America, I had a crop of hay, which was in a manner spoiled by rain, being almost rotted in the fields; yet did this hay spend as well as if it had been got in ever so favourably. When my servants were making up the stack, I had it managed in the following manner: that is, as soon as a bed of hay was laid about six inches thick, I had the whole sprinkled over with salt; then another bed of hay was laid, which was again sprinkled in like manner; and this method was followed till all the hay was stacked. When the season came for cutting

* Dr Anderson's *Recreations in Agriculture*; Mr Young, in the *Annals of Agriculture*; Rev. Mr Dacre, in communications to Newspapers; Mr Varley, in his *Farmer's Guide*; Lord Somerville, in communications to the Board of Agriculture; Dr Paris, in a Memoir in the *Transactions of the Royal Geological Society of Cornwall*; in papers published by Sir John Sinclair; Lord Dundonald, in his *connexion of Agriculture with Chemistry*; A North American Planter, in the *Museum Rusticum*; Mr Kingston, given before the Board of Trade; Mr Horne of Liverpool, given before the Board of Trade; Mr Hollinshead, in *Hints to Farmers and Country Gentlemen*; Rev. Dr Cartwright, in his *Prize Essay*, communicated to the Board of Agriculture; Mr Wood of Ingatestone, Essex.

this hay and giving it to my cattle, I found that, so far from refusing it, they ate it with surprising appetite, always preferring it before the sweetest hay that had not in this manner been sprinkled with salt."

Lord Somerville, in a communication to the Board of Agriculture, speaks in terms of high commendation of the benefit of salt applied to hay in fattening cattle. "It is well known," observes his Lordship, "that hay, mouldy from rain, is rendered palatable and remarkably nutritious to cattle, by simply strewing salt on the stack, at the rate of ten or fifteen pounds per ton, when making: equally notorious is it, that a sensible effect is hereby produced to the taste; that cattle will prefer it to better hay, well put together, and will demand, when fed on it, without injury to themselves, three times as much water; which circumstance alone accounts for that aptitude to fatten which is conspicuous in hay so salted. It remains to be proved how good hay, which had not spent its strength in premature fermentation, would bear such a quantity of salt as would invigorate the stomach, quicken the circulation of the blood, and excite in cattle a desire to drink largely. That it does bear it, and that the effect this hay has upon stock almost surpasses belief, we have ascertained. Some of our hay, lately in use, was of the first quality of sheep hay, the produce of rich and deep loam on a limestone bottom; it was put together without wet, and had twenty-five pounds of salt per ton sprinkled through a sieve, a greater quantity than has yet been used. In colour, flavour, and proof, it equalled any hay whatever; and satisfies us, that this or a greater quantity of salt may be infused into hay of the best quality, and with the best possible effect. In confirmation of these facts, we have also the authority of Mr Darke of Breedon, one of the most celebrated graziers in the kingdom, who has mixed salt with his flooded, mouldy hay, eight pounds of salt only to a ton, and declares that his Hereford oxen did better on it than others on the best hay he had, and that he was, and is, convinced, that the hay had all its good effect from the salt. Salt cannot be conveyed into the animal in a more effectual manner, than by sprinkling it on hay through a sieve, when in the act of putting together; for every particle is imbibed in the fermentation, without a possibility of waste."

Mr Young, in the *Annals of Agriculture*, also speaks highly of this practice. "We must beg leave," says he, "to recommend the salting of ricks. I am persuaded that few farmers are aware of the benefit arising from this practice, particularly in stacking in sultry weather. The salt preserves the hay from over heating and becoming mildewed: it may be put together greener than otherwise, without danger of firing. All kinds of cattle, &c. prefer inferior hay, thus managed, to the best that can be placed before them that has not been salted: the salt assimilates with the juices of the hay, and thereby prevents too great a fermentation. The proper way of using it is, in building the stack, to sprinkle the salt alternately between each layer of hay, in the proportion of 20lb. or 25lb. per ton."

The latter quantity was also used by Mr Dacre himself. His method of mixing it with the hay was as follows: He had a riddle, the meshes of which were one-eighth of an inch, and at every span as he advanced in the mow, he riddled twenty-four pounds of pure salt upon the hay per ton, estimating the ton by the acre. No bad effect, he adds, was seen during the sweetening of the hay. The cattle that fed upon it were healthy, in high condition, and far superior in appearance to cattle in the vicinity, that had not the benefit of salt. He observes, that hay should not be salted with foul or damaged salt; and that hay damaged by unseasonable weather, or hay well saved, must be made, housed, or stacked, perfectly dry, when salt is applied. Mr Varley, in his *Farmer's Guide*, also recommends the sprinkling of hay with salt. "Hay thus treated," says he, "is converted into a kind of salt marsh, which is the most wholesome land we have. The farmer of an inland country might nearly supply the place of a salt marsh, by giving his cattle salt amongst their food."

Salt has also been given with benefit to calves. Mr Wood of Ingatestone, Essex, says, that a calf-jobber, who had many sucklers which he could not sell to advantage, kept them; but being short of milk, he gave them oatmeal-gruel, by which he lost many of them, until he was recommended to put some common salt into the gruel; he attended to this advice, and did not lose another calf. By the Table of Mr Curwen, which we have given when speaking of the uses of salt to horses and cows, it will

be seen that he gave one ounce of salt per day at twice to his calves. We have seen it given to them in a fattening state with happy effects. Indeed, it frequently happens, that in the case of calves feeding on milk without the aid of any other food, the stomach becomes disordered, the animal loathes its milk, and does not increase in fatness. A quantity of salt dissolved in water, given under such circumstances, will restore the tone of the animal's stomach, by which it will take milk with greater zest, and increase proportionally in fatness.

Though a great quantity of salt given to hogs is considered by some to be injurious, in America it is occasionally given to them, to render them tame, and prevent their being lost in the woods. Mr. Curwen gave salt to his hogs, by mixing it with steamed potatoes, on which he fed them. It is said, that in some places in Ireland, salt is sprinkled on every meal which is given to hogs, by which they are found to fatten in half the time they would otherwise require. Hogs that have access to coal-ashes are known to be very fond of a small quantity of the semi-incinerated parts of the coal. As there can be no nourishment in a mineral, especially in that state, the only object in taking it, we must suppose, is to stimulate the energy of the stomach.

Such are the general opinions and practices of the uses of salt to domestic animals, which we have endeavoured to condense and present in order. For a more general account of this subject, we must refer to the work under notice, where will be found ample details to compensate the reader's research, given to a length which our limits do not allow us to go. The work is professedly a compilation, and, as such, it does much credit to its author, for the mass of information on the uses of salt which he has collected together. He has drawn from the stores of a pretty extensive agricultural library, and presented in the volume before us, a fund of knowledge deduced from the opinions and practices of our most celebrated agricultural writers regarding the various uses of that ingredient.

Both analogically, as adduced from the habits of wild animals, and from the general current of that host of evidence which we have laid before our readers, we have been led cor-

dially to acquiesce in the opinions so generally expressed in favour of salt as a condiment for animals. And it is a subject on which any one, even the most credulous, has a ready means of satisfying himself, by putting it to the test. It is not, like many schemes and improvements, which, to be profitably practised, or practised at all, must be done so on the large scale. In the case in question, it may be profitably practised by the carter who has only one horse, the private villager with his single cow, or the isolated cottager, whose whole stock of edible animals may consist in a single pet ewe, or, perchance, a solitary hog; in either of these cases, it may be practised as successfully as by the farmer with his thousands of sheep, his hundreds of cattle, his scores of horses, or his well stocked piggery.

The greater part of the experiments and general usages which we have stated, were made and practised when the price of salt, fettered by a heavy and impolitic tax, rendered the using of it very expensive; but now that salt can be purchased at such a low rate, it becomes in an eminent degree accessible to the uses of the agriculturist. Should it be theoretically contended, that though salt does no harm to the animals to which it is given, it is not thought to possess those properties which have been contended for it, and that it is not of that advantage generally, which would compensate the expense and trouble of using it, we would say that every farmer may in a very simple manner satisfy himself: Let him take any number of his sheep, cattle or horses, of the same breed, which in every respect receive the same food and treatment, and give to one portion of them salt, while the other portion of the same animals receives none, and in a short time he will be able to judge for himself, whether the use of salt is of such advantage in the food of his live stock as to merit its general adoption.

ON THEORIES OF POPULATION.

The Law of Population ; a Treatise in Six Books, in Disproof of the Superfecundity of Human Beings, and developing the Real Principle of their Increase. By MICHAEL THOMAS SADLER, M. P. 1830.

It being assumed that each pair added to the human race has an equal power of propagating the species, and it being found that, under the common law of mortality, communities or countries can add to their numbers, it is contended that the human race has a power to increase in proportion as their numbers increase ; or, in other words, to increase in a geometrical ratio. If the inhabitants of a country shall be found to add in each year, or other period, one-hundredth part, or one-thousandth part, or one ten thousandth part, to the numbers existing at the preceding year or period, and this increase shall be constant, then it is correct to say that the increase is in a geometrical ratio. The arithmetical questions with which all are familiar, relating to the increase of money at compound interest, furnish examples of the geometrical ratio of increase, and of its numerical effects, when the series is sufficiently extended. A penny put out at interest, at the birth of our Saviour, would, at 5 per cent. simple interest, have increased, at the present day, to 7s. 8½d. ; while, if put out at compound interest, it would have amounted to a sum equal to more than a million of times the bulk of the earth of gold.

The precise power of man to increase in numbers may be determined, either by observing the actual increase of the inhabitants of a country under circumstances favourable to the increase of their numbers, as in newly settled colonies, or by reasoning from observed data on the rate of mortality, and the number of the born in different countries.

Assuming that the number of births to each marriage is 4, which nearly accords with the observed fecundity of marriage in the temperate regions of Europe ; that the age of marriage is 20 in both sexes, which is a possible supposition ; that the law of mortality is what registers now show it to be in England ;

and, accordingly, that the number of those who live to marry is what these registers indicate; that the sexes at the age of marriage are equal in number; that all marry once, and only once; assuming further, that a birth takes place in the second year from all the marriages then existing, and another birth in every second year thereafter, till the number of 4 children is born for each of the marriages at first contracted;—then could it be shown, setting out with a new born pair, that the population would increase at a rate sufficient to double itself in about 26 years.

Were it a law of nature that the human race should multiply in this ratio, then it is certain that, long ere now, every country, and all the earth, would have been filled with inhabitants. Not only would the earth have been peopled, but a number would have been born far more than sufficient to have peopled all the planets in the solar system. It has been supposed, reasoning from registers kept in different countries, and particularly from the censuses of the States in North America, that man possesses the power of increasing in numbers in a ratio as great as is here supposed, although it is apparent that the data are all too favourable to the supposition of human prolificness. It has been even assumed, and reasonings have been founded upon the assumption, that man has a power, in all states of the population, to double his numbers in each succeeding period of 25 years. Without entering here into the question, whether this supposition is a possible one, which we deny, let it be granted that the possible period of doubling were once in 25 years, and that this were the actual law of human increase;—then the number of mankind would have been doubled, since the era of the Deluge, 167 times. Now, the number of persons saved from the Deluge was 8, namely Noah, his wife, his three sons, and his sons' wives. The number 8, therefore, multiplied 167 times by 2, would have amounted to—1,496,577,676,626,844,588,240,573,268,701,473,812,127,674,924,007,424,—a number which, with relation to the finite capacities of man, is infinite; and which is sufficient to have peopled not only the earth, the sun, and all the planets, but infinitely more than all the stars which the telescope can render visible to the eye of man. A geometrical ratio of increase, there-

fore, such as that assumed, leading to an impossible conclusion, involves an impossible hypothesis, and cannot be the law of human increase.

Neither has it been yet shown that the law of human increase is in any geometrical ratio whatever. To warrant this inference, it is necessary, amongst other data, to assume, that, in all states of society and of population, the same number is born to each marriage; that the same number lives to marry; and that the same number does marry,—none of which suppositions accord with observation*.

As nations become civilized and populous, their habits change. The love of offspring and domestic union, common to man in every stage of society, often gives way to other passions, and above all, to the desire of gain. To the pursuit of gain alone, the years of youth are often wholly devoted; and this, combined with other desires and pursuits which the state of the society calls into operation, tends to retard or prevent the marriage union. The medium period of marriage, therefore, does not remain constant in all states of society and the population; and hence an essential condition of the geometrical ratio of increase, as applied to the human race, is wanting.

Neither is it proved that, in all states of society and the population, the same proportion marries. If the medium period of marriage shall, by a change in the habits of the people, be rendered more late, the same number of persons, under the same law of mortality, will not live to marry; and besides, it is known that, in populous societies, many of both sexes remain, from various causes, in a state of celibacy.

Neither is it established that the number of births to a marriage is the same in all states of society and population. As the population of countries increases, so is there an establishment or increase of towns, which doubtless are, as registers show, less favourable to the fruitfulness of marriage than the country. On this account, Middlesex is found to be greatly less favourable to the fruitfulness of marriage than any other part of Eng-

* It is necessary to assume, that the excess of the number of the births above that of the deaths of every year, has a constant ratio to the number of the living at the commencement of the same year. But it has never yet been attempted to be proved that this law obtains in any country.

land, and the district of the Seine than any other district of France. Luxury and excess are the necessary concomitants of towns; and physicians have long been aware that luxury and excess diminish the fruitfulness of marriage. Mr Sadler even endeavours to found a general law of population on the supposition of this diminution in the fruitfulness of marriage. But, while we are not disposed to question the fact, under certain limitations, we do not, as we shall afterwards show, draw the same conclusion from it which Mr Sadler has drawn. It is here sufficient to observe, that, granting that neither the age of marriage, nor the numbers that marry, nor the fruitfulness of marriage, are constant in all stages of society and population, then the whole foundation of the hypothesis of a geometrical ratio of increase, as applicable to man, is taken at once away:—a failure in any one of the conditions of which we speak is fatal to the whole hypothesis.

It is not logical to infer that, because the population of any country is seen to double its numbers in a given period, the law of its increase is a geometrical ratio. The following series is in arithmetical progression,—1, 4, 7, 10, 13, 16, 19, 22, &c. The number here has been quadrupled at the first term of the series, and yet the ratio is not a geometrical but an arithmetical one. Into this error Mr Malthus and his followers seem to have fallen. From the censuses of the United States of America, it appears that the population has increased to a certain amount in a certain period. This, however, does not show the law of increase as applicable to the species; it does not show the law of increase in England; in France, or in Austria; nor does it follow that the increase in America will be the same in the next quarter of a century, much less in that which is to follow. The facts, therefore, deduced from these censuses, granting them to be fairly deduced, which we do not grant, do not show that the tendency of man is to increase in a geometrical ratio. For any thing the censuses prove to the contrary, the ratio of increase may be an arithmetical and not a geometrical one.

Mr Malthus assumes, that in all cases, the power of man is to increase in a geometrical ratio, and thence infers the *tendency* of man to increase in a geometrical ratio. But even if the premises were conceded, the consequence would not follow; for the

power of man to increase may not be synonymous with, or necessarily imply, the tendency of man to increase. It is a possible supposition, that the tendency of man to increase may correspond for a longer or shorter time with his power to increase; but no necessary relation exists between the tendency and the power. And the reason of keeping the distinction in view is this: To prove the power of man to increase, under the supposition that nothing occurs to disturb the ratio of increase, we may reason from an abstract property of numbers; in the other case, we must, of necessity, found our reasoning on observation. In the case of a penny put out at interest, the possible increase is demonstrated by a property of numbers; and so likewise is the supposition of a geometrical ratio of increase as applied to mankind. The result is deduced solely from a property of numbers. To prove the tendency or actual increase, we must resort to a different species of evidence, namely, observation.

Mr Malthus, assuming the power of man to increase in a certain geometrical ratio, concludes, that the possible increase of the numbers of mankind must always exceed the possible increase of the supplies of food; and granting the premises, this is merely a self-evident proposition, since no possible increase of the produce of food can correspond with the possible ratio of human increase which Mr Malthus has assumed, or with any geometrical ratio, if we suppose the series to be sufficiently extended. Nay, he not only concludes that the tendency of man is to increase in a geometrical ratio, but he determines the ratio of increase to be, in given periods, as 1, 2, 4, 8, 16, 32, 64, 128, 256, &c.; while the supply of food can only, on the most favourable supposition of the possible productiveness of the earth be, in the corresponding periods, in the arithmetical ratio of 1, 2, 3, 4, 5, 6, 7, 8, 9, &c.; so inferring, that the tendency of man to increase as compared with his power to increase his food, will be represented thus:—

Tendency to increase—1, 2, 4, 8, 16, 32, 64, 128, 256, &c.

Power to produce food—1, 2, 3, 4, 5, 6, 7, 8, 9, &c.

This may indeed show what is meant by a geometrical, and what by an arithmetical ratio; but when applied to demonstrate a law applicable to man, and his power to supply himself with food, it involves a fallacy. It is only when the corresponding terms of both series are equal, that they can agree in any case

with the actual state of mankind with relation to his supplies of food *. It is evidently absurd to suppose that there is any period in the history of man, in which his tendency to increase is represented by the number 256, and his power to supply himself with food by the number 9. Or, if we wish to amuse ourselves with the whole hypothesis, we have only to carry the series a little farther to find, that, in a very few generations, the tendency of man to increase would be all but infinite with respect to his power to supply himself with food. The case would resemble the imaginary one of the penny put out at interest, which, on one supposition, would amount to a few pence, and, on another, to more than a million times the bulk of the earth of gold. It would be arrived at, too, by the same species of reasoning, namely, by reasoning from an abstract property of numbers. The whole hypothesis, it is obvious, involves a physical impossibility. In what period of the series, let it be asked, does the present race of men exist? It is evident, that it is only at the periods corresponding with the first and second terms of the series that man *can* exist, namely, when his tendency to increase in numbers is the same as his power to supply himself with food.

Seeing, then, that we cannot demonstrate the tendency of man to increase beyond the means of subsistence by reasoning from a property of numbers, we must resort to the only species of evidence of which the nature of the proposition admits,—observation. Now, resorting to observation, it may well be denied that any such tendency as Mr Malthus supposes exists as an observed law of nature with relation to man.

Mr Malthus, indeed, endeavours, in all cases, to fortify his arguments by an appeal to observation in support of them ; but, then, how does he reason in the present case? He infers the tendency in question from the actual poverty and wretchedness of the great mass of the labouring population in different countries. From this poverty and wretchedness he concludes, that the numbers of these classes are constantly pressing upon the means of subsistence. This reasoning is not more logical than that which it is intended to support. To make the argument good, it must be shown that other causes than this imagined tendency do not produce the wretchedness and poverty of the labouring classes. But, can we open the me-

* Sadler.

lancholy pages of history, or look at the state of the human race in so many countries, and be at a loss for discovering causes of poverty and wretchedness. What is it that has reduced the once flourishing population of Spain from twenty-four millions of souls to eight millions? Shall we search for the cause of the wretchedness and poverty that have led to this result, in a tendency of the people to increase beyond the means of subsistence, or in the effects of oppression, ignorance, and superstition? What is it that has reduced the fairest portions of the habitable earth to a desert, and kept them so? Is it the tendency of man to increase beyond the means of subsistence, or is it ignorance, superstition, tyranny, and other effects of the evil passions of man? Let us look to the countries around us which boast the most of their civic institutions, and say whether, in the best of them, there are not causes to be found for the wretchedness and poverty of the labouring classes.

In observing the state of different countries at the same time, or of the same country at different times, it is not seen to be established as a general law, that, as they have become more populous, the supply of food has become less in proportion to the population. The converse of this proposition is rather established, if we are to trust to facts observed. History, with scarce an exception, shows us that as nations have become more populous, the population has become better supplied with the necessaries and conveniences of life. It would seem that the more men labour in common, the greater will be the result of their combined efforts. Countries have been cited as exceptions; but it may be questioned whether they are really so: nor, if exceptions were established, would these invalidate the general principle. Ireland, so often referred to, now supplies with raw produce a great part of the rest of the kingdom. It is ascertained by records that cannot be questioned, that, when the population was incomparably less, the fare of the inhabitants was more wretched and scanty, and that dreadful famines, not periodical scarcities, were of perpetual occurrence. We do not suppose that any candid person will appeal to scarcities, the effects of less productive seasons, as a proof that this or any country has outgrown its means of subsistence. If this argument were good, then every country, however thinly peopled, may be said to have outgrown its means of subsistence. The wretchedness of Ireland does

not seem, in any degree, to arise from its *means* to produce food having become inadequate to supply the population, but rather from the want of means in the poor man to exchange his labour for food, which may be traced to very different causes. With respect to China, and the wretchedness and poverty of its inhabitants, so constantly appealed to in support of this theory of population, our better knowledge of that country, and the concurrent testimony of all recent travellers, disprove the whole assumptions. It does not appear that the labourers of any country are better supplied with the necessaries of life than those of China; and as to the excess of population, of which we have heard such marvels, the whole is known to be mere fable. China, it is now admitted, is far less populous than England. The tendency of man, then, to increase, beyond the means of subsistence, is no more proved by the case of China, than of any other country *.

So complete and universal, indeed, is the discrepancy between this theory and the facts, that an acute writer, Mr Senior of Oxford, has recently contended, in opposition to Mr Malthus, that the tendency is in the food to increase beyond the number of people, and not in the number of people to increase beyond the supplies of food. And, although logical objections may be shown to exist to the terms of this proposition, it yet better indicates the state of things than the theory to which it is opposed. Mr Senior founds his argument upon a fact, namely, that according as there is observed to be an increase in the number of people in countries, there is observed to be a yet greater increase in the supplies of food. Mr Malthus draws a different conclusion; but then, he reasons from erroneous and insufficient data; he reasons from a property of numbers rather than from facts observed.

But Mr Malthus not only argues that this tendency is constantly in operation in all countries, and that there is, therefore, a constant pressure in all countries of the population upon the means of subsistence; but he argues that this, unless counteracted by what he calls moral restraint, is the very means which Nature employs to check the redundant numbers of mankind. He maintains that the poverty and wretchedness thus produced, tend to produce an increased mortality, and that this

* Sadler.

increased mortality, reacting upon the increasing population, checks its progress; and this hypothesis constitutes what has been termed the principle of population. The whole hypothesis, however, is opposed to the stubborn evidence of facts. An increased mortality is not found to result from an increase in the number of the inhabitants of countries. The registers of England, and of every country in Europe where registers exist, prove, that as the numbers have increased, the mortality has diminished. The general proposition, then, laid down by Mr Malthus, and on which he founds his system, is not proved to be a law applicable to the human species.

Pestilence, famine, and wars, with other horrors, are enumerated by Mr Malthus as amongst the means which Nature provides for lessening the redundant numbers of the human race. Yet pestilence and famine are known to have greatly lessened as countries have increased in population; and war has become far less destructive of life than when the number of those who could be its victims was fewer. The wars of modern Europe, long continued as they have been, are as nothing to the exterminating wars of antiquity, and are scarcely seen to affect the registers of mortality. But, whether by the operation of famine, pestilence, or wars, the certain result is, that the mortality of man has not increased as his numbers have increased. Taking Europe throughout, the part of the globe which furnishes the surest foundation for reasoning of this nature, the fact is beyond dispute, that, as population has advanced, the mortality has diminished; proving incontestably, that it is not a general law of Nature, that, as population increases, it produces an increased mortality of the species.

Assuredly, then, a tendency of man to increase in a geometrical ratio, and so to increase beyond the means of subsistence, is not proved by any deduction from admitted premises, and is altogether unsupported by the evidence of facts. But, if a tendency to increase beyond the means of subsistence is not proved to be a law applicable to man, it is yet a legitimate subject of inquiry why this tendency does not exist. But this, be it observed, is altogether different from assuming that the tendency exists, and then reasoning upon that assumption. Yet this is the error of Mr Malthus and of all his followers; they invari-

ably assume the existence of this tendency, and thence deduce that frightful train of consequences, from which, in opposition to all facts observed, we are to infer increasing evils from the progress of population and society.

A tendency of man to increase beyond the means of obtaining food, and this tendency corrected by the fortuitous effects of natural and moral evils—pestilence, famines, and the evil passions—is a supposition little in harmony with what we are enabled to observe of the operation of the laws of the material world. These, in so far as we can trace their effects, are uniform and constant. Death, indeed, as well as life, we see to be a law of nature. Every creature that is born must die, and death is thus the universal check upon the increase of the numbers of all animated beings. But, by a wonderful provision of Providence, the mortality, however produced, of every living species seems to be perfectly adapted to the prolific powers of that species, so that none can increase beyond its allotted space in creation. It would be strange if some provision were not, in like manner, made for an increase in the numbers of the human race beyond the limits of its food. What the precise nature of that provision may be, we may indeed, in our weakness, fail to discover. We will endeavour to render it probable that *reason* is at least one of the means which Nature has provided for this purpose, and thus far we shall agree with the opinions of Mr Malthus. This supposition, we apprehend, is in nothing inconsistent with the goodness of Providence. On this supposition, man will still maintain his superiority over all the other animals: they are led to multiply their species by instinct, or organic change, operating at fixed periods upon the female. Another law applies to the human race, who have the power of reason to regulate their desires. But be the causes that regulate the number of the human race what they may, it is sufficient, for the purposes of our present argument, that a tendency to increase in a geometrical ratio, and so to increase beyond the means of subsistence, is not shown to be a law of nature. This being conceded, we are freed at once from all the revolting, we may say impossible, consequences, to which the opposite supposition conducts us.

{ We have heard it contended, as a kind of defence of the theory

of Mr Malthus, that his argument really is, that there is a tendency in the human race to increase in a geometrical proportion, but that this tendency is counteracted by opposing tendencies. This, in other words, is to say, that the tendency does not exist. The whole of the mechanical laws of nature may be said to be confined in their action by opposing tendencies. The tendency of a body put in motion, it may be said, is to move forward for ever in a straight line : but if we cast a stone in the direction of the moon, we do not say that the tendency of the stone is to move in a straight line towards the moon. The stone returns to the earth by an opposing tendency, that of gravitation ; its tendency, therefore, is not to fly to the moon, but to fall upon the earth. No philosopher would say that the tendency of the planets is to move in a straight line, forming a tangent to their orbits : their tendency is to move in their orbits *round* the sun. Equally incorrect would it be to say that the tendency of man is to increase in a geometrical ratio, if opposing tendencies prevent the increase of man in that ratio. If these opposing tendencies exist, the tendency of man is not to increase in a geometrical ratio.

Why man does not tend to increase in a geometrical ratio, and so to multiply his species beyond the means of subsistence, may be a problem yet unresolved. Mr Malthus supposes certain checks to exist upon the gratification of animal passion, which he terms moral restraint ; a supposition which, if pursued to its consequences, might lead us to the general proposition, That man does not tend to increase beyond the means of subsistence, because he is endowed with reason. Mr Malthus admits the full force of this power, to the exercise of which he has applied the term Moral Restraint. But then the argument of Mr Malthus should have been, not that man has a tendency to increase beyond the supplies of food ; but that man, if he were destitute of reason, would have a tendency to increase beyond the supplies of food. To the proposition thus enunciated, we should not greatly object, because we think it may be held that it is mainly because man is a reasonable creature, that he does not tend to increase beyond the supplies of food.

Man has the power to vary his habits with the circumstances in which he is placed ; unlike the lower animals, which, unless un-

der a state of compulsion, do not vary their habits. As he advances in civilization, and forms himself into crowded societies, other habits than existed in the ruder states are adopted, more or less favourable to the increase of his numbers. And, at different stages of civilization, and in different countries, the rate of increase is found to differ. In some civilized communities, the population increases slowly; in others, equally advanced, it increases rapidly. Thus in England it advances at the present time with great rapidity; while, in the rich and fertile country of France, it is nearly stationary. In the latter country it increases, accordingly, far more slowly than in Ireland, and the difference can only be satisfactorily traced to a difference in the habits of the people. In the one country, a certain degree of forethought and providence is seen to be exerted amongst all classes, before entering into the married state. The medium period of marriage is thus retarded, and numbers of both sexes, from various causes, remain in a state of celibacy. In the other country, the great mass of the population marries at the earliest possible period of youth. The powerful effect of this difference in accelerating or retarding the population, could be shown by an arithmetical calculation. Without, however, entering into numerical details, we shall observe, in illustration, that, supposing each married pair of a country to give birth to a family of which one pair lives to marry, and this pair to give birth to another pair which, in like manner, lives to marry, and so on; then can it be shown that the population of such a community will be stationary. It appears, therefore, how slight a change in the habits of the people would affect this state of the population. Supposing that only one pair out of 10,000 did not choose to marry; or that, by a retardation of the average period of marriage, one pair out of 10,000 did not live to marry, the population would at once be rendered retrograde.

As countries become populous and civilized, innumerable objects occupy the mind;—ambition, and the desire of distinction amongst some; and, amongst all, the pursuit of gain in various forms. From this cause alone, a portion of early life is generally devoted to labour of the mind or body, during which men do not always charge themselves with the duties of marriage; and thus throughout the whole society, the period of the marriage union is

retarded. In simpler states of society, those innumerable motives which civilization calls into action, do not operate either to retard or prevent the marriage union; and, accordingly, amongst savages or barbarous nations, the period of marriage is almost always early. The savage marries as soon as he reaches the age of manhood. Even love itself, peculiar, it may be presumed, to reasoning creatures, acts differently in these different stages of society. In the one the passion is gratified as soon as it is formed; in the other it is matured into mutual esteem by reason, reflection, and time. While, therefore, man, in crowded societies, shall remain what he has hitherto been, we may suppose that the same desires and principles of action will exist, and produce the same results.

In classing all the causes which, in populous societies, tend to retard or prevent the marriage union, under the term *Moral Restraint*, we think that Mr Malthus employs a somewhat unhappy term and defective classification. It is evident that a restraint upon the passions does not imply all the motives which, in such societies, act upon the mind. Neither do the terms *Vice* and *Misery*, which Mr Malthus calls *Positive Checks*, in contradistinction to the other, which he calls the *Preventive Check*, in any degree indicate the causes which, as mankind become civilized, retard the medium period of marriage. But all these causes, we apprehend, may be resolved into the power of the human will, dependent upon reason.

Mr Malthus, however, as we have seen, notwithstanding the possession of the reasoning power, seems to infer a constant pressure upon the supplies of food, a poverty and wretchedness in all countries, as a necessary consequence of increasing numbers. In vain does all observation refute the inference. Looking through the medium of his favoured hypothesis, he sees a constant succession of evils in the tendency of man to increase in a geometrical ratio, and so to increase beyond the means of subsistence. But, looking through the medium of facts, he ought rather to infer, that of all the evils which a civilized society has to dread, one of the least to be guarded against is an increase of the number of inhabitants beyond the means of supplying themselves with food. If it be possible to suppose an exception any where, we may suppose that it will be found where the inhabitants possess the

advantages of civil institutions, and yet still remain as ignorant and improvident as if they continued in the state of barbarians. An exception of this nature, should it be found to exist, would in no degree establish it to be a law applicable to the species that man has a tendency to increase beyond the means of subsistence.

Assuming the tendency of man to increase beyond the means of subsistence, as a general law of Nature, it is not surprising that Mr Malthus should see in its effects a succession of terrible consequences to the human race,—famines, pestilences, wars, the murder of infants, and every species of crime. He even supposes an oscillation, as it were, between the numbers of mankind and their prosperity. If the increase of population shall, in any country, become great, he supposes that the necessary effect will be poverty and wretchedness, producing the dreadful visitation of a great mortality. This, he assumes, acting upon the redundant numbers, will afford a temporary relief to the survivors. Again, however, the population obeying its natural impulse, will advance, until it is again reduced by the same frightful means.

Happily for the prospects of mankind, nothing is less consistent with universal experience than such monstrous conclusions, such, if we may so term them, impossible suppositions. Natural evils, and the often more dreadful effect of human passions, have indeed ere now spread death and desolation over countries; but this has not been seen to be a necessary consequence of increasing numbers and advancing society. Nor is it found, that, when such evils have arisen, the consequence has been increased plenty to the survivors. We shall have perused the page of history in vain, if we can draw such conclusions.

If we look to the fairest portions of the habitable earth, we shall find indeed that they have been visited and laid waste by these fatal checks, but not because of the pressure of the people upon the means of subsistence. It was when the principle of population was most active, when these devoted lands were covered with cities, that they were blessed with plenty. It is since the loss of their people that their glory has passed away. Poverty and want have followed their decreasing numbers. Famines, pestilence, vice and misery, all the checks have ope-

rated in their turn ; but it was when they were no longer wanted to repress the increasing numbers of a happy people.

But imaginary consequences are not all with which this theory of population has been charged. It is said that it leads to maxims of governing mankind, little consistent with their prosperity ; that it teaches us to look upon the increase of our fellow-creatures as an evil ; and to adopt means little in harmony with the better feelings of nature, for repressing the increasing numbers of mankind.

And, truly enough, the terms in which Mr Malthus has thought fit to announce some of his doctrines, have given cause for such charges. Extolling celibacy as a duty and a virtue, he denounces all public provision for the poor, lest it should hold out too much inducement to the labouring classes to marry. He seems to forget that marriage is not a sin, but a duty, an obvious provision of Nature, and necessary not only to promote the happiness, but to preserve the morality of the poor ; and when he counsels society not to provide for its afflicted members, he seems to forget that, amongst these, are the helpless, the sick, and the aged. He would even repress the exercise of private charity. He would give to the wretched with a grudge, and in stinted measure. In his zeal to propagate his philosophical tenets, he almost appears to overlook the tenets of that doctrine which we are bound to reverence, and in which mercy and charity are prescribed as amongst the first of human duties. It is marvellous that a good man, for such Mr Malthus is, and a man possessing profound and happy talents, should be so blinded by a mere philosophical dream, as to propagate opinions thus revolting to the feelings, we may say to the common sense, of mankind. Does he not perceive that, if such deductions were a necessary consequence of his premises, these premises would be disproved by nothing short of a *reductio ad absurdum* ? Men of generous minds, accordingly, even where they have been unable to trace the fallacy of the reasoning, have found it impossible to believe that to be true, which infers so much of evil in the moral government of the universe, and which would render it a virtue to stifle the feelings of mercy in the breast of human beings.

But granting even the tendency which Mr Malthus contends

for, Does it really follow that this tendency would be repressed either by restraining private charity, or by abolishing all public provision for the indigent? And, first, with regard to private charity, Do men marry in the doubtful hope that their issue will not be suffered, through the mercy of others, to perish? Men, we may well believe, may marry improvidently, but rarely, indeed, on a cool calculation that they or their offspring will not be suffered to die of want when affliction or old age overtakes them. Such, we may rest assured, are never the anticipations of youth; such are not the reasonings of the young and the happy, when, in the hey-day of life, they enter into the married state. The youthful pair may perchance charge themselves too hastily with the burden of supporting a future family; but wretched, indeed, were their humble lot, if, when the nuptial blessing was given, they could think of sorrow, and suffering, and alms. The fear, then, that the bad example of compassion to the wretched, will tempt the young to marry, is assuredly founded upon a very great misconception of the feelings even of our humblest poor.

Neither does Mr Malthus reason more happily when he condemns a public provision for the indigent, as being calculated to induce men to multiply too rapidly. In populous societies, there can be no choice between a public provision for the indigent,—and beggary. Human beings cannot be suffered to starve in the midst of food. If the society will not provide for the wants of the indigent, the indigent must be suffered to crave relief from those who have the means of affording it; and, so far as we know, accordingly, no society has yet existed which would neither relieve the wants of the afflicted, nor suffer them to ask relief. Such a principle, it is apparent, must be confined to the theories of the closet. It is impossible that it can be reduced to practice.

We must of necessity, then, choose between a public provision for the indigent,—and beggary. And granting that we must make this choice, let us appeal to common sense, which of them is the most calculated to degrade the character of the receiver. Is it a public provision from the funds of the society for the support of those who are unable to earn their bread by labour,—or beggary with its necessary attendant, vagrancy?—the one implying the payment of a debt of justice and humanity by the more opulent members of the society to the poor, the afflict-

ed, and the old ; the other rendering mean or degraded those whom it keeps from starving, and necessarily leading to idleness and false pretences. Which is the most calculated to produce habits of decency and good order in a society ? The state of those countries where the different systems exist, will answer the question. One cannot compare, as travellers know, the state of countries where the poor are supported from a public fund, with that of countries where they are suffered to depend upon alms and casual charity. And with regard to the effect of a public provision for the poor in encouraging marriage, we have only to look at the state of Ireland, to learn whether the *absence* of such a provision tends to keep the poor from marrying.

The *right* of the poor to subsistence, too unthinkingly sneered at by Mr Malthus, cannot be reasoned away by the sophistries of philosophy *. The right of all who are born to receive food, is founded upon a right as sacred as that by which any earthly possession can be held. It is founded upon the unalienable rights of humanity.

Of all the countries known to us, England is that in which it would be the least wise to substitute a system of beggary for one of a legal provision for the poor. As a substitute, beggary would be altogether insufficient. Where so vast a manufacturing population exists, where a glut of goods, a lack of demand, or a sudden failure of credit, may at once plunge thousands of those who are willing to labour into a state of destitution, it is absurd to talk of beggary as a means of relieving want. If such a system were permitted, the whole country would be more overrun with beggars than any country in the world. It is, ridiculous, then, to complain of the increase of poor's rates in England as an evil that can be avoided. If we have chosen the perilous path to wealth, which we now pursue,—if two-thirds of our labouring population are to continue manufacturers and artisans for the supply of half the world with manufactures, we must pay the necessary price of our gains ; we must provide for the casualties which such a state of society is calculated to produce. Looking at the vast increase of this part of our population, the wonder appears to be less, that, under such an anomalous condition of society, and with so many admitted defects in the mere administration of the law, the claims of the indigent should have

increased, than that they should not have increased yet more. A large part of the poor's rates of England is expended in litigation, arising from the laws of settlement; and the whole expenditure is greatly increased by defects not inherent in the system, but arising from its mal-administration.

The manner in which these and similar doctrines were originally propagated by Mr Malthus (for he has since softened his expressions, if not modified his opinions), has drawn down a series of constant attacks upon the whole principle of his theory. The earliest of its antagonists was Godwin, whose generous, but visionary, doctrines regarding the possible perfectibility of man and his institutions, accorded ill with the appalling conclusions of the supposed law of population. The latest and most powerful antagonist is the gentleman whose work we have quoted in our title, and who brings to the elucidation of the whole question, learning, research, and the happiest powers of illustration. Mr Sadler traces this theory of population to all its dreadful consequences, and investigates with diligence all the facts on which its reasonings are founded. In detecting and exposing the errors and the fallacies of many of these, we conceive that Mr Sadler has been eminently successful; while, in establishing another law of population, in the place of that which he has endeavoured to destroy, it is as obvious to us that he has entirely failed.

Mr Sadler's theory would set wholly aside the power of reason in influencing the numbers of mankind. It would substitute a physical law, operating independently of the will. He contends, that, by a law of Nature, the power of man to multiply his species diminishes in proportion as his numbers increase. He endeavours to show that the operation of what Mr Malthus has termed the preventive check, is cruel, partial, inconsistent with reason, and, more than all, utterly inefficient. He maintains, that a retardation of the period of marriage is useless as a means of repressing the increasing numbers of a country; for that late marriages are more prolific than early marriages. Were this truth established, it would be a remarkable one; although not more remarkable than other truths which are known with relation to the principle of propagation. But we apprehend that it is not established that the productiveness of late marriages is greater than that of early marriages. We admit, indeed, that,

by an equally wonderful provision of Nature, the periods of child-bearing are, upon an average, more distant, when the female is young, than when her age is greater. Mr Sadler, it would seem, has drawn an erroneous conclusion from this fact. Finding that, up to a certain period, the number born to a given number of early marriages was less than that born to a given number of later marriages, he inferred that the latter were more productive than the former. It is the opinion of those who have considered this subject well, that, upon an average, late marriages are *equally* productive of children as early marriages, but not more productive*.

But even conceding within a reasonable limit Mr Sadler's position—granting that what may be termed late marriages are more productive of children than early marriages—still this would not bear out his proposition, that late marriages are equally favourable to an increase of numbers as early marriages. It is obvious, that if the period of marriage is early, there will be a greater number of generations produced within the same period, and thus there will be a greater existing population; and further, that if the population be increasing at all, the increase will be greater when a greater number is born within the same period. Besides, it is to be observed, that as the medium period of marriage is deferred, the number of those who die previous to the period of marriage is increased by the constantly operating law of mortality; and, consequently, a smaller number of persons live to marry. We could easily show, by calculation, how powerful and direct the influence is which a retardation of the period of marriage produces on a given population. We are unwilling, however, at the present time to enter into calculations of this nature, which would lead us beyond the limits which we must assign to these observations.

Mr Sadler's hypothesis, therefore, relating to later marriages, even admitting its truth, which however we do not admit, does not bear out the conclusion that, under the same law of mortality, the increase would be as great from late marriages as from early marriages. Neither, as we will endeavour to show in very few words, has he established his more general proposition, that the power of man to increase diminishes as his numbers are in-

* Evidence in the Report of the Committee on Friendly Societies.

creased in a given space. This proposition he endeavours to deduce from a general theorem,—that the fecundity of marriage diminishes in proportion as the population increases in a given space, or, in other words, diminishes inversely as the numbers of the population. This proposition, as enunciated by Mr Sadler himself, is, that “ The prolificness of human beings, otherwise similarly circumstanced, varies inversely as their numbers.”

This very hardy hypothesis, however, is not only not proved by the facts adduced in support of it, but it is disproved by them all. Mr Sadler does, indeed, show, from the registers of various countries, that the fruitfulness of marriages diminishes when the population becomes more dense ; but he does not show that the fruitfulness diminishes in *proportion* as the population becomes more dense, or, in other words, *inversely* as the population. Mr Sadler, as a mathematician, knows this distinction, and he knows its necessity. If the population of a country were to be doubled, it would follow, upon his hypothesis, that the fruitfulness of marriage would diminish one-half ; or, if the population of one district of a country were double that of another, that the fruitfulness of the marriages of the one district would be one-half that of the other, which does not in the remotest degree accord with the fact. But let us take one of Mr Sadler's own tables as an illustration. The following table exhibits, according to Mr Sadler, the comparative prolificness of marriage in the following countries.

COUNTRIES.	Inhabitants on a Square Mile, about	Children to a Marriage,
Cape of Good Hope, . . .	1	5.48
North America,	4	5.22
Russia in Europe,	23	4.94
Denmark,	73	4.89
Prussia,	100	4.70
France,	140	4.22
England,	160	3.66

Now, what would be the result if the fruitfulness of these marriages were inversely as the population ? The children to

a marriage at the Cape of Good Hope being, by the table,	5.48000
the number in North America, should be	1.37000
in Russia in Europe	.23826
in Denmark	.07369
in Prussia	.05480
in France	.03914
in England	.03425

Thus, in England, it would require somewhat more than twenty-nine marriages to produce one child !

If it shall be said that Mr Sadler, by inversely, does not mean an inverse ratio, but some other ratio which is not inverse, we answer, that there are no double meanings in mathematics, that all its definitions are precise. If the fruitfulness of marriage is not in an inverse ratio to the population, we ask, What is the ratio to which Mr Sadler's theorem refers ; for from the Tables themselves no determinate ratio, nor any thing approaching to a ratio, can be traced ?

If Mr Sadler's proposition is designed to support his own argument, he must mean, that, as population increases, the fruitfulness of marriages will decrease in some ratio, and that this ratio will be sufficient to render the increase of population more slow. But what say facts, and the registers, in support of this opinion ? In England, the population was once greatly more scanty than it now is. According to Mr Sadler's proposition, the increase of population should have been greater. But the registers show us, that the increase is now far greater than at any antecedent period. In Ireland, still more remarkably, the numbers have continued to increase, as the population has become more dense. What, then, becomes of the supposition, that there is a natural law causing mankind to increase more slowly in proportion as their numbers increase. Granting that the fruitfulness of marriage becomes less as the population upon a given space becomes greater, still it is evident, that the decrease of this fruitfulness does not perform the function which Mr Sadler assigns to it. The population of countries does not increase more slowly as the population is more dense ; nor does the rate of increase bear any determinate ratio to the density of the population.

If Mr Sadler merely proposed to show, that a geometrical ratio of increase does not exist, because the fruitfulness of marriage is not a constant quantity in all states of the population, we should agree in the conclusion. This we before adverted to; but it is evident that Mr Sadler means to infer much more than this. He means to infer, and he does infer, that the productive power of the species is determined by a law dependent on the density of the population.

The power of man, however, to increase in numbers is not determined by a law dependent upon the density of the population, as all the registers show us. Nor, if it were so, would Mr Sadler get rid of the influence of reason and the will. That the fruitfulness of marriage becomes in most cases somewhat less as the population becomes greater, we admit. We have already observed, that the population of countries increases with the establishment or increase of towns, which are known to be greatly less favourable to the fruitfulness of marriage than the country. It has never been questioned that the luxury and vices of towns render married females less fruitful. But this does not set aside the influence of reason. Luxury and the vices of towns are not the consequences of a physical law, but of the gratification of human passions dependent upon volition. Mr Sadler, indeed, may, if he pleases, add to the number of the preventive checks. To the moral restraint of Mr Malthus, he may add luxury and excess, and thus we shall have turtle and gin amongst the preventive checks. But granting that a diminution of the numbers born in marriage, arising from increasing luxury, is a provision against the increase of the numbers of mankind, still Mr Sadler would not get rid of the influence of reason upon the rate of human increase. Mr Sadler opposes not only the doctrines of Malthus, but the opinions and experience of mankind.

No one has yet doubted that a great demand for labour and high wages will be favourable to an increase in the numbers of the labouring population of any country. But this could not be, if the increase of their numbers were regulated by a physical law, dependent upon the density of the population. Adam Smith long ago remarked, that human beings will increase as the demand for them increases. The supposition must have been

a very erroneous one, if the increase of population were dependent on a general law, extrinsic to the demand.

What is it, we ask, that makes the population of one country increase faster than that of another, equally or more favoured by nature? It is not surely because the fruitfulness of marriage is greater in one country than another, in proportion as the density of population is less, for in this case the numbers should increase more rapidly in Spain than in England,—at the Cape of Good Hope than in the United States of America,—in France than in Ireland. And why does not population increase as rapidly in France as in Ireland, seeing that there is no inferiority in the fertility of the soil, and the happiness of the climate, to account for the inferior progress of population; and seeing, too, that it cannot be because the fertility of marriage is less in France than in Ireland; for, upon the hypothesis upon which we are reasoning, the fruitfulness of marriage should be less in Ireland than in France, the population being more dense? We can trace the effect, it is apparent, to no other cause than to a difference in the habits of the people. In the one country, the people are contented to live on one species of food, and that the cheapest and most easily procured,—to clothe themselves in rags, and to dwell in hovels. In the other country, the peasants need the decencies, and demand certain of the enjoyments of life. Or let us compare together France and England, and ask again why the population does not increase as quickly in France as in England? Whatever cause may be assigned, it cannot, on our present hypothesis, be because the fruitfulness of marriage is less in France, by a law dependent upon the density of the population; for, if this were so, the population should increase more quickly in France than in England. No one, we think, need hesitate to ascribe the cause, in part at least, to that vast demand for manufacturing labour which has existed in England.

And not only does Mr Sadler propose a very erroneous, but, as we apprehend, a very pernicious doctrine, in support of which it is in vain to appeal to the Divine injunction to increase and multiply. The command, we may reverently presume, is to be fulfilled under the guidance of reason, and not of the passions. And it cannot be a good doctrine to teach the poor that

it is virtuous to yield to the impulse of passion, and disregard the injunctions of reason ;—that forethought and prudence, which, in all the other duties of life, lead to virtuous habits, may in one momentous duty alone be cast aside.

It were an error to contend, that early and too precipitate marriages are the most productive of virtuous habits. More often it is found, that, when the reason is matured, the marriage union is the most productive of happiness and virtue. Love, peculiar, as we have said, to reasoning creatures, is not founded on passion alone, but on mutual esteem; the consequence of reason, and the result of reflection. Nothing is more frequently seen in common life, than that the marriages of boys form ill-assorted and unhappy matches. Now, looking beyond the range of common observation, and extending our view to societies, it is not shown that that reasonable retardation in the medium period of marriage which is seen to accompany the progress of civilization and society, and to be a consequence of it, tends to demoralization and licentiousness. In Scotland, more providence and forethought are manifestly exercised in entering into the married state than in Ireland ; and yet it is not found that the peasantry of Scotland are less moral than those of Ireland. In Norway, according to the concurrent testimony of travellers, the peasantry enter into the married state with a deliberation which evinces previous forethought ; and yet we would do wrong to the virtuous peasantry of that country, to compare them with the inhabitants of some countries where no such restraint upon the passions exists,—as with the back settlers of the United States, where the early marriages do not prevent unbridled debauchery.

But if it is not well to contend that the passions may be allowed full play, and the reason laid asleep in this as in any other duty of life, so neither is it necessary to resort to exhortation to celibacy and “moral restraint.” The motives to retard the period of marriage are too many in civilized and populous countries, to render it necessary to preach this up as a virtue. The preaching has besides this absurdity attending it, that no one will regard it. Men will marry, we may be assured, in spite of the geometrical ratio ; and well it is that common sense is generally, in such matters, an overmatch for philosophy. It is enough that, in yielding to the natural desire of domestic union, men will be governed by reason as well as passion ; and in order

that reason may perform its function, the true philosophy is to endeavour to substitute knowledge for ignorance, to better the condition, and promote the happiness, of the labouring classes. This will best be done by governing them well; by good laws, well administered; by giving them something to gain, something to lose, or the hope of gaining something. This will render even the humblest circumspect; and this, we may be assured, is the true preventive check. If men are reckless and improvident, we may rest assured that is where they have nothing to lose, nothing to hope for, no sense of the decencies and enjoyments of life. Then, indeed, we may find them indifferent to the present and regardless of the future. Then, indeed, we may find a picture as hideous as the following realized, to the eternal scandal of the governing power. "The population is immediately increased," says the Catholic Bishop of Leighlin, in his evidence on the state of Ireland, "as every one must perceive, by improvident marriages; but those marriages themselves, in my opinion, result, in a great measure, from the extreme poverty of the people, for that poverty has paralysed their energies; it has prevented them taking such an interest in creating a respectable situation for themselves in life, as men possessed of some property always feel; for those wretched people say their state cannot be worse when married than before, and hence they go together. Their depression throws them together like savages in a wood. It is a frightful state of society; and, when it is considered, it fills me with so much pain and horror, that I have frequently prayed to God, if it were his will, rather to take me out of life than to leave me to witness such evils."

We argue, then, that the best, the only safeguard against too great an increase of the numbers of mankind, if such a fear need indeed be entertained, is to govern them wisely. Let industry be protected, that all men may acquire something, or possess the hope of acquiring something; let good laws be established, and bad laws abrogated; let all freedom be given to industry, and then we may dismiss, as an idle dream, the fear that men will multiply too fast for their means of subsistence. If men, indeed, shall be suffered to be brutalized by poverty and want, they may go together "like savages in a wood," but this is not the consequence of increasing numbers and advancing society,—but of a vicious state of society.

In the country we inhabit, so happy in its institutions, as compared with many others, how many yet are the vices of our social system which may be corrected; how many are the restraints upon industry that may be removed; how much of the natural liberty of mankind, unjustly taken away, may be restored? Let us look to the numerous causes which impede the natural flow of capital in all its channels; to unhappy laws that prop up the interests of the few at the expense of the many; to the unequal distribution of property forcibly produced by the remaining institutions of ruder times, when law itself was founded upon the power of the strong over the weak, and trampled upon the rights of humanity. But be the causes what they may, which produce unnecessary poverty amongst the labouring classes, let these be removed, and we need not then seek to diminish the numbers of our people; we need not inculcate upon our poor in their humble sphere, the duty of celibacy, but encourage them rather to enter, as soon as reason prompts them to do so, into a virtuous union, which the laws of nature, good morals, and private happiness demand.

No society, governed well, we repeat, has been known to outgrow, or tend to outgrow, its means of subsistence. When in our own country, one of the most populous in the world, we see how far the earth is yet from producing all that labour well directed can bring forth, when we look at the tracts lying waste or half cultivated, we must see how little it is to be feared as a possible evil, that our population will ever increase beyond the means of supplying itself with food. We have only to look to what minute care can effect in multiplying the produce of the earth, to feel in what a prodigious ratio it may be multiplied*. A piece of heath land the most worthless, converted into a cottager's garden, yields a return of food exceeding that of the richest land of the cultivated fields. And nothing prevents the increase of this species of culture, but the want of hands to cultivate, and of mouths to consume. Every vegetable that grows, and is consumed, affords new materials for fertilizing the earth, and increasing its productions; and thus every increase of the number of consumers is a means of calling new food into existence.

* Sadler.

The introduction of a single plant from another hemisphere, has more than doubled the power of this and of every country in Europe to support inhabitants. An acre of potatoes will supply food sufficient for the support, in healthful existence, of a family of six human beings, for one year; a square mile of land producing potatoes, therefore, will support 3840 persons for the same time. But the produce of the potato is as nothing to that of the banana and other plants of the tropical regions. Nor does the produce of the potato in our fields show the full power of the earth to produce food. By the minute cares of the gardener, successive crops of vegetables may be produced from the same surface, and in the same season. Our present knowledge of agriculture shows us, that, throughout the whole kingdom, the productions of the earth may be prodigiously multiplied; but what our present knowledge of this art is in comparison with what it may become, we know not. What other plants are yet to be applied to the support of animal life, what other means of fertilizing the earth are yet to be discovered, what other application of mechanical power may yet take place in aid of human labour, we know not; nor need we, with relation to our present subject, be too curious in inquiring. It suffices that, with our present means and knowledge, limited as they are, we can multiply our means of subsistence in a degree to furnish food for increasing numbers for more generations of men than the cares of the living race need extend to.

And if such be the case with a long peopled country, what must we think of the fear that the entire world will be over-peopled? The richest regions of the globe have yet been scarcely trodden by the foot of the hunter; a great part of Europe is still a desert; and a long desolation has overspread lands that once were the seats of nations, and which only demand liberty that they may be blessed with abundance again. Such are Asia Minor, Syria and Greece, and such the long desolated shores of Northern Africa, on which the Christian standard has at length been planted by a gallant people—planted, let us hope, once and for ever. It is not Nature that is barren of her gifts, but man that has abused them all. Tyranny and superstition have gone hand in hand. The imposture of a vile camel-merchant has imposed shackles of ignorance upon half the human race. In the

climates and the lands where we might look for the verdure of an eternal spring, we find only the moving mountains and interminable tracts of the desert. Yet in the desert, states have flourished and cities have stood of old; and the mouldering columns remain to testify, that the desolate sands had once been covered by the bounties of nature, and the fruits of industry.

And if we shall turn from the land to the ocean, which covers three-fourths of the globe, we shall find that animals are there produced in countless abundance, and all that is wanted is the art and the labour to reach them. The produce of a single pair of fishes would multiply in a ratio so prodigious as to defy calculation. All the vacuum, therefore, which the wants of man can create in the animals of the ocean, is as nothing to what the prolific powers of nature could instantly repair. But on these, and all similar parts of the argument, we refer to the admirable Work which has called forth these observations.

However erroneous we hold the particular theory to be which Mr Sadler has attempted to establish, however inconsistent with itself many parts of his argument may seem,—that he has been eminently happy in exposing a long train of fallacies, to which the prevailing doctrine of population has given rise, it were a want of all candour to deny; and we predict that the judgment of the public will not be slow to ratify this opinion. We will not now attempt to point out errors which we conceive him to have committed. These we leave to the critics, who will find a sufficient number of them on which to avenge themselves for the too unsparing invective with which he has treated the doctrines to which he is opposed.

In giving praise where it is so justly merited, we are anxious to guard ourselves from giving the sanction, even of our humble authority, to the mischievous and mistaken opinions which Mr Sadler has elsewhere, with a marvellous inconsistency, thought it fitting to espouse. Such, amongst others, are his opinions upon certain branches of political economy, and, in particular, his support of the long exploded errors of the mercantile school—errors discountenanced by the generous system of the French economists, and set at rest, one would have hoped for ever, by the genius of Smith. The theories which Mr Sadler has chosen with relation to this subject, are fitting ones for

the vulgar declaim of either *House* ; but they are unworthy of philosophy and a mind like his.

But if Mr Sadler has elsewhere supported doctrines which we must condemn, and which his better judgment may ere long lead himself to condemn, in the work before us we find enough to redeem a thousand errors of opinion. In his multifarious and elegant illustrations—in the glowing imagery of his language—in the generous enthusiasm with which he pleads the cause of humanity and virtue—he gives an interest to every part of a seemingly barren subject, which nothing but the touch of genius could have given. Nothing can be happier than the manner in which he draws from the rich stores of his classical and historical recollections. In treating of the wars and migrations of ancient times, he shows us, in a masterly sketch, how little these wars and migrations had to do with the want of room, the struggle for food, the tendency of man to increase beyond the means of subsistence. Of all the causes for shedding innocent blood, the struggle for food seems the least to have been thought of ; even sophistry, in endeavouring to palliate outrage, and to find pretexts for violence, seems never to have thought of this. But let our elegant author speak for himself. The subject is Greece, and those lovely Islands, so dear to the recollections of every scholar, which we have seen, by a too heartless policy, resigned to their oppressors. But let it be so—it can only be for a season—the flame of liberty is lit upon their mountains, never to be quenched again.

“ Cos, an island, small, and sufficiently distant, and almost too insignificant withal to attract the notice of the elder Greek historians, rose rapidly to prosperity, in consequence of not being involved in these struggles for room, and becoming an asylum to those who were. It was scarcely twenty miles long, and five wide ; but it soon contained a multitude of inhabitants ; and after the ruin of their principal city, by an earthquake, a new one speedily arose, which vied in splendour with the first in Greece. This took place in the twentieth year of the Peloponnesian war ; and there was abundant time to put the principle of population, and its consequences, to the test, in the many hundred years which followed ; during which we find it described, by Diodorus Siculus, as becoming very populous, and

growing more and more both in public revenues and in the private wealth and riches of its inhabitants, till it rose to that state and grandeur, which, says he, it now enjoys. It is quite natural to suppose, that their advances in useful knowledge, as well as the higher refinements, kept at least an equal pace; and, to this interesting fact, the Coan names of Hippocrates and Apelles will ever bear witness. Now, however, all is changed, except the face of Nature itself; vestiges of ancient taste and magnificence are scattered in every direction, and applied to the commonest purposes, affording a memorial of the difference between an overflowing, and what our modern philosophers choose to denominate a redundant population, and one checked down 'to the level of the means of subsistence.'

"The more celebrated island of Cyprus has been already mentioned as inviting colonists to its shores; and it is sufficiently plain, that the inducements were soon very effectual. We find, from Herodotus, that at least six distinct races, which he enumerates, were early settled in the country. With the increase of its inhabitants it grew in prosperity and abundance; so that, from the wild and uncultivated state in which we noticed it to have been originally, it became 'a rich and populous country, producing plenty of corn, and famous for the excellency and abundance of its wines and oils.' It is calculated that it then contained at least one million of inhabitants; the question, therefore, is, whether the principle of population had, as predicted, reduced these to want and wretchedness. On the contrary, it is as undeniable a fact as any history records, that it was wealth which occasioned their ruin, by exciting the insatiable rapacity of the Romans. One of their own historians, Ammianus Marcellinus, plainly acknowledged it. Cato was the murderous plunderer, whose death, by suicide, would have been prevented by the hangman, had he lived in any age or country where liberty and justice were more than names. At the present moment, Cyprus may perhaps contain a bare twelfth part of its former inhabitants; and their individual degradation has corresponded with their numerical diminution.

"Crete may be the next instance. Not exempt, indeed, from intestine broils, nor yet wholly free from foreign aggressions, yet secured, during considerable periods of its history, from any thing approaching to the equal operation of the check

under consideration, by its insular situation, and by its naval supremacy, which, Aristotle says, it seemed naturally formed to hold in Greece, Crete enjoyed a measure of prosperity proportioned to that exemption; and while it so grew in population as to have acquired, in Homer's time, the epithet of Hecatompolis, from its hundred cities, it sustained that population in so much happiness (which we are assured is always measured by the plenty of food), as to obtain from Pliny and Solinus the distinction of Macaros and Macaromeson. Even the epithets of a less favourable nature, which were frequently applied to Crete, were, in all probability, to be traced to their superior wealth, exciting the envy of the surrounding states. Polybius stigmatizes them for their love of amassing riches, and their habit of increasing them. It is observable, that Aristotle does not sanction the accusations which were usually cast upon Crete; on the contrary, he says, that some of its institutions were preferable to those of Sparta, especially those relating to that general provision, which spread their "Andreia, or common tables, and afforded food to persons of either sex, and of all ages, in the country;" a plain impossibility, we are now told, even applied to that wretched remnant of our population, the public poor,—Nature having provided no such room at her table, whatever the Cretans did. We have reason to believe that their institutions were preserved, and their freedom enjoyed, for the long space of thirteen hundred years; and, populous as was the country, we know that it did not fall by the weight of its numbers, to use a curious expression of Puffendorf, but became another victim to the insatiable cruelty and avarice of Rome, which, as again one of her own historians candidly confesses, "*si vera volumus noscere*," coveted the conquest of so noble an island. That reason was abundantly sufficient, and the inhabitants were exterminated.

"But the last instance I shall adduce is by far the most interesting one—Rhodes. Compared with all the states of continental Greece, this happy island seemed to have enjoyed a long state of peace, and its infallible consequence, prosperity; such as few countries ever experienced, either in measure or duration, and fewer still ever deserved so well. The maritime power which, like the other islands previously mentioned, Rhodes also possess-

ed, if it did not preserve its contracted territory absolutely inviolate, at least protected it from many of those "struggles" which constantly convulsed the continental states, while the justice and moderation which its people observed in all their naval affairs, made their maritime laws those of the civilized world, being adopted by Rome, and wrought into her Pandect. The materials of a lengthened eulogium present themselves to the recollection of every moderate scholar, and are, I confess, passed over with reluctance. But enough has been already said on this branch of the argument. The Rhodians maintained their liberties for the unexampled period of about two thousand years, and Rome had again the disgrace of annihilating them. The recorded charge against them, of universal luxury, proves, that unchecked as was their population, comparatively speaking, still their numbers did not exceed the means of subsistence, but the reverse. But their institutions solemnly record a still more interesting proof of this fact, so important to our present argument. In Rhodes the poorest and most destitute individual was never deemed redundant, much less pernicious; this discovery these heathens left for the politico-theologists of our present Christian age. They preserved their poor, universally, with the most sacred care. 'They laid it down, as a rule, that every man should work for his maintenance while he was able; but, when no longer able, he should be as well maintained at the expense of the state.' How 'absurd*'; our modern theorists being the judges! especially in such a crowded population, and so confined a territory, as that of Rhodes. Favoured, however, beyond the lot of most other countries upon the face of the earth, the Rhodians maintained their liberty and enjoyed their growing prosperity for the unexampled duration of nearly twenty centuries! nor were either endangered or destroyed by the principle of population,—the parental evil of human beings, according to Mr Malthus. No. Rome, as has been said, had, at length, the infamy of extinguishing this ancient state; and Christendom the double disgrace of tolerating 'the malignant and the turban'd turk,' in trampling down the wretched remnant of human beings, which Rhodes still contained, to 'the level of human subsistence;' a retrograde operation, which would never be completed till it had extinguished the species."

* Malthus, *Essay on Population*.

MISCELLANEOUS NOTICES.

1. *On Domestic Brewing.*—For making excellent ale or table-beer, it is not absolutely necessary to use malt. To conceive this subject rightly, we must consider that it is the sugar of the malt which undergoes fermentation, and that any other sugar will ferment just as well, although no other sugar is so cheap. Economy and long habit have established malt-sugar as a brewing material, but cane-sugar will afford an excellent drink. To persons residing in the country, and far from breweries, as well as to those who do not choose the great trouble of managing malt, this is a valuable fact. Another advantage of cane-sugar is, that the apparatus necessary for converting it into beer is much more simple; all that is required, is a cask which has no bung-hole, or has it well stopped up. This is to be set standing on either of its ends: a cock is to be fixed in one of the staves, about an inch above the bottom chimb, so that, in drawing off the liquor, the sediment cannot also run. In the centre of the top of the cask, that is, in the centre of its other end, a hole is to be bored, of such size as will admit a large bottle-cork. Let us suppose that the cask holds 10 gallons, and the drink is to be tolerably strong ale.—The proper quantity of hops required for 10 gallons of ale, in this process, will be about 1½ lb. On this quantity, contained in any convenient vessel, pour on 11 gallons of boiling water; or, what is much better, boil the hops in the water for about five minutes, and no more: then strain off the hops: in the strained liquor dissolve 14 lb. of sugar, and mix in a pint of yeast of the best quality. Pour the whole into the cask: it will soon begin to ferment; it will throw up its yeast through the cork-hole at top, and, this being retained within the external rim of the chimb, it will, for the most part, fall back into liquor, and run back into the cask. It will require, at the ordinary temperature of summer, so much as three weeks or a month to complete the fermentation. For the last fortnight the cork may be generally kept in the hole; but it should, once every two days, be removed, to give vent to the fixed air, and then replaced. When the fermentation appears at an end, the taste of the sugar will almost entirely have disappeared, it will be barely perceptible. The cork may then be permanently driven in, and in four days the ale will be fit for draught, or for bottling.—As to the quality of the sugar, it is a matter of little consequence; white sugar will afford an ale scarcely coloured; brown sugar will impart proportionate colour, and not quite so pure a flavour. Should colour be an object, it may be communicated by the raspings of an over-baked loaf, or by scorched treacle; but this is matter of little moment. The drink will spontaneously fine itself. — To persons who have acquired an inveterate predilection for the abominable and varied flavours which the *skill* of the brewer enables him to communicate, this pure and simple drink may be less pleasing; but it is singular how soon the consumer acquires a high relish for it, and prefers it to every other. There is a purity of taste belonging to it quite different from the indescribable jumble of tastes so perceptible in common ales, and a light sharpness combined with tenuity, which is much more agreeable than the glutinous or

mucilaginous softness of even the best ales. But it has one advantage which places it above all competition, and that is its lightness on the stomach; this, when compared with the sickly heaviness of malt-ale, is really remarkable. The whiter the sugar the lighter will be the ale; and age greatly conduces to the same end, provided that the drink is sound, which is best ensured by bottling.—Hops are by no means the only bitter which may be made use of for preparing and flavouring such ales; others can much more conveniently be procured in certain situations. Mixtures, in various proportions, of wormwood, powdered bitter oranges, gentian root, and rind of Seville oranges, will afford an excellent bitter, perhaps more wholesome than hops, and, if skilfully combined, to the full as palatable: in this position *the brewers cannot refuse to bear me out*, for reasons with which many of them are acquainted. Gentian, and particularly quassia, must be used sparingly; for the bitterness of these is of so lasting and penetrating a kind, that much of it is sure to be disagreeable.—It has been shown by M. Dubrunfaut, that a good beer can be produced from potatoes: the potatoes are to be grated to a pulp; this is to be well mixed with boiling water, and ground barley-malt is to be added. The liquid being drawn off, is to be hopped in the usual way, yeast added, and the fermentation induced. The beer thus produced, after being bottled, was found greatly to resemble Paris beer. In certain parts of Ireland an excellent beer is brewed from parsnips, by a process somewhat like the foregoing, except that no malt is used: the bitter employed is hops. In short, malt is by no means necessary to the production of wholesome and agreeable beers.—*Lardner's Cyclopædia; Domestic Economy*, vol. i.

2. *Increase of the Numbers of Mankind*.—On the supposition that the human race has a power to double its numbers four times in a century, or once in each succeeding period of twenty-five years, as some philosophers have computed, and that nothing prevented the exercise of this power of increase, the descendants of Noah and his family would have now increased to the following number:—1,496,877,676,626,844,588,240,673,266,701,473,812,127,674,924,007,424.

The surface of the earth contains, of square miles, . . 196,663,355

Mercury, and all the other planets, contain about 46,790,511,000

The sun contains, 2,442,900,000,000

2,469,887,174,355

Hence, upon the supposition of such a rate of increase of mankind as has been assumed, the number of human beings now living would be equal to the following number for each square mile upon the surface of the earth, the sun, and all the planets,—61,062,000,000,000,000,000,000,000,000,000,000; or to the following number for each square inch,—149,720,000,000,000,000,000,000,000,000. This last number alone is infinite with relation to human conception. Merely to *count* it would require an incredible period. Supposing the whole inhabitants now upon the surface of the globe to be one thousand millions, which is believed somewhat to exceed the actual number, and supposing that this multitude, infants and adults, were to be employed in nothing else but counting,—that each were to work 365 days in the year, and 10 hours in the day, and to count 100 per minute, it would require, in order to count the number in question, 6,536,500 millions of years.

3. *Comparative Severity of the Winter at Paris and Edinburgh.*—Mr Thomas Blaikie, a native of Corstorphine, near Edinburgh, Ingenieur des Jardins Anglais at Paris, and who has been settled for half a century in the neighbourhood of that city, mentions several striking examples of the great severity of the Parisian winter. Last winter, 1829–30, scarcely any plants of *Viburnum Tinus* or *Laurustine*, escaped with life at Paris, although this shrub was in flower during the whole winter with us. At Paris the *Alaternus* was greatly hurt, and strong Cypress trees (*Cupressus sempervirens*), were killed; large trees of the Aleppo pine (*Pinus Halepensis*), and of the sea-pine (*P. maritima*), were likewise killed. Mr Blaikie adds, that it will seem strange to a Scotsman, yet it is nevertheless true, that in the commons near Paris, the *whin* or furze (*Ulex Europæus*) was, last winter, killed to the ground; while on our Blackford and Braid Hills the plant was covered with flowers in the beginning of February. In gardens about Paris, the fig-trees which were left uncovered were all killed. But what is remarkable on the other hand, and may afford a lesson to our cultivators of ornamental shrubs, large plants of *Magnolia grandiflora* stood without any covering; and, although the leaves were destroyed, yet the trees have shot out afresh. With us this fine species of *Magnolia* was first tried in the open air at Colinton House, near Edinburgh; magnificent plants of it may be seen trained against the south side of the high wall of the Royal Botanic Garden at Inverleith, under the management of Mr Macnab, and these have yielded their noble and fragrant flowers very freely, during the present summer, though not a favourable one. This *Magnolia*, we doubt not, will soon be more generally cultivated in our gardens.

4. *Milk-tree of Demerara.*—Mr Smith, in a letter to Professor Jameson, published in the Edinburgh New Philosophical Journal, gives an account of a tree discovered by him on an excursion up the river Demerara, possessing most of the qualities ascribed by Humboldt to the *Palo de Vaca*. It is a different species, however, and is described by Mr Smith as 30 or 40 feet high, with a diameter at the base of from 16 to 18 inches. The milky juice, which it exudes very copiously on being cut, was thicker and richer than cow's milk, and destitute of acrimony, but without any considerable proportion of nutritive ingredients. It mixes freely with water. Mr Arnott, who has examined the dried specimen transmitted by Mr Smith, refers it to the genus *Tabernaemontana*, and proposes naming it *T. utilis*.

5. *Alimentary Tuberole of Van Diemen's Land.*—A singular substance has been found at the depth of a foot, or a foot and a half, in the earth of that country. It has not yet been described, but is called *indigenous bread*. It is covered with a thin skin, has a rounded form, like a potato or yam, and is sometimes as large as a man's head. When cut, it appears to be composed of a solid spongy mass, containing a considerable quantity of alimentary matter. No root or fibre has been found adhering to it, so that sometimes it has been thought to be a sort of terrestrial polypus, possessing a principle of animal life. The only indication of its presence which the natives have, is the occurrence of an exceedingly small leaf, which rises from the earth, and is connected with it by very thin and delicate fibres, which break whenever the tuberole is raised.—*Asiatic Journal*.

6. *Salicine*.—M. Leroux, an apothecary at Vittry-la-Francais, has extracted from willow-bark a new substance, to which he gives the name of *Salicine*. This substance presents itself under the form of white crystals, having a very bitter taste, resembling that of willow-bark. It has been ascertained that its medical properties are very powerful, and that it may be advantageously employed in place of Peruvian bark. M. Magendie administered it in doses of 18 grains per day, at three several times, 6 grains at each, and this quantity he found sufficient to repel intermittent fevers.—Experiments have also been made in several of the Paris hospitals, and particularly in the Hotel-Dieu and La Charite; and it has always been found, that the quantities of from 18 to 24 grains at the most, administered in doses of 6 grains, were sufficient to prevent the return of the accession. Three pounds of willow-bark yield an ounce of *salicine*; and if the extraction were carried to a greater extent, it is probable that the same quantity of bark would yield two ounces.

7. *Docility and Faculties of Domestic Animals*.—M. Dureau Delamalle lately read a memoir to the Academie des Sciences, in which he endeavoured to prove, 1st, That domestic animals are susceptible of a much higher development of the intellectual faculties than is commonly supposed; 2dly, That they possess, but within limits which we have not yet been able to determine, instinctive qualities, faculties of imitation, memory, reminiscence, will, deliberation, and judgment; 3dly, That the individual, and even the race, are capable of being improved in proportion to the knowledge of the classes of people with whom they live, the education which is bestowed upon them, their wants, their dangers, and in general the circumstances in which they are placed; 4thly, That several of the qualities which are looked upon as instinctive are in fact qualities acquired by their faculties of imitation, and that certain acts which are attributed to instinct are elective actions belonging to the domain of intellect, memory, and judgment. The author adduced numerous facts in support of each of these propositions. He showed that domestic animals, and especially dogs, acquire the defects and predominant qualities of the societies or individuals among which they live. Of the facts which tend to prove the influence which imitation exercises on the habits of animals, we may mention the following. M. Dureau Delamalle observed a dog, which having, at the age of two months, been placed with a cat of six months, and brought up along with it, without having any communication with the animals of its own species, acquired the habits and manners of the cat. It bounded in the same manner when it ran, amused itself with rolling round bodies with its feet, played with dead mice, and rubbed its head and ears with its feet. The cat, on the other hand, had not been in any degree changed by its intercourse with the dog; and this circumstance must no doubt be attributed to its having a much less propensity to imitate. Many animals really educate their young. Birds of prey, for example, which teach their young not only to fly at and seize their prey, but also to catch it dexterously on the wing. The author has observed falcons and hawks training their young in this manner. I lodged, said he, from 1794 to 1798, in one of the combles of the Louvre. The building was not then finished, and contained many birds of prey, which, not being molested in a city where it was not permitted to shoot them, were quite tame. My window looking into the

square court of the Louvre, I had many opportunities of seeing the birds. At the time when the young were beginning to fly, I have often seen the old birds coming with a dead mouse or sparrow in their talons, hovering over the court, and calling to the young birds which remained in the nest. The latter came forth on hearing their parents, and fluttered under them in the court. The old birds then rose perpendicularly, apprising their scholars of the circumstance by a loud cry, and let fall the prey, on which the young birds precipitated themselves. At the first lessons, with whatever care the old birds dropped the mouse or sparrow, so as to fall near the young ones, it was seldom that the latter caught the object; and, when they failed, the old birds came down like a ball, and carried it off before it had reached the ground. They then ascended to repeat the lesson, and never allowed their pupils to eat the prey until they had caught it in the air. When the young birds had become perfect at this exercise, the old ones brought them living birds, and repeated the above manœuvre until the former were able to catch them, and had consequently learned to provide for themselves.—*Le Globe*.

8. *On the Productiveness of Plants and Animals*.—The great end of the fructification is to produce the seed, and thus to perpetuate the species. The care taken by nature to effect this, and also to disseminate the seeds when ripened, calls for our highest admiration. There is, however, another object in view than the continuation of the species merely, for multitudes of animals are to be fed and supported by them. To this source man himself is indebted for bread, "the staff of life," and many races of animals subsist entirely on vegetable seeds; and hence, plants in general produce a much greater number of these than is necessary for their own continuance. The same observation will equally apply to animals; and it may not be uninteresting to glance at the comparative fertility of the two. In so doing, we need not advert to the multitudes of insects and microscopic beings which inhabit almost every department of nature; a few observations on *fishes*, which, perhaps, more than any other animals, carry on a constant state of mutual predation, will be sufficient. Their roe, or spawn, is left to take its chance amongst thousands of enemies; and were not the *ovula*, or seeds composing it, extremely numerous, not only would the respective species be much thinned, but many others would be deprived of a principal source of nutriment. It might seem like exaggeration to assert that a *smelt*, only two ounces in weight, should have in its roe 38,278 eggs, or that 4,096,000 have been computed in the pea of a single *crab*; yet nothing is more true. In the middling-sized *cod-fish*, Leuwenhoeck found 9,384,000; and the following calculation is not a little curious:—"A *cod-fish* was lately sold at Workington market, Cumberland, for 1s.; it weighed 15 lb., and measured 2 feet 9 inches in length, and 7 inches in breadth. The roe weighed 2 lb. 10 ounces, one grain of which contained 820 seeds or eggs; the whole, therefore, might contain 3,001,440 seeds. Supposing that each of the above eggs should have arrived at the same perfection and size of the mother-fish, its produce would weigh 26,123 tons, and consequently would load 261 sail of ships, each of 100 tons burthen. If each fish were brought to market and sold for 1s., this would net a clear sum of L. 195,000!" (Daniel's Rural Sports, vol. ii. p. 34.) Yet this comes far short of the fertility of the *sturgeon*, a single fish of this species containing in its roe 150,000,000,000 of eggs.—*Drummond's First Steps to Botany*.

QUARTERLY AGRICULTURAL REPORT.

JULY 15. 1830.

THE causes to which we referred in our last Report, as tending to increase the prices of corn, have recently received a yet further impulse from the unfavourable state of the weather, leading to the presumption of a retarded harvest, if not an unproductive crop. The stocks in the hands of the merchants, it is now generally admitted, have not been lower at any period during the last twenty years, while the supplies of the farmer seem to be nearly exhausted. This state of things is distressing to the nation and the consumer, without being beneficial to the grower. Large importations have been made, and are in the course of being made, from abroad; and, unless these are greater than there is some reason to believe they will be, it is probable, that, before harvest, the price of grain will reach a higher point than it has yet attained. Large supplies have usually been calculated upon from Ireland at this season; but these are likely to fail in consequence of the state of distress which exists in many parts of that country. On this subject, so great an apprehension exists in Ireland, that extensive orders for oat-meal, for reshipment to the country, have been sent to Scotland. Many of these have been executed; but it is now found, that in Glasgow, from which the shipments have been made, there is not above two weeks consumption of oats; and, consequently, instead of there being any thing to spare, it has been found necessary to apply to all parts of the continent for supplies. From Liverpool too, considerable shipments of meal and barley have been made to Ireland; but the stocks in that town are so much reduced, that more cannot be spared at present. Under these circumstances, it is to be presumed, that nothing but the contraction of domestic consumption, arising from the pressure upon the great mass of consumers, has prevented prices from rising in the same manner as they have been seen to advance in former cases of real or apprehended scarcity. As it is, it is the opinion of those who are conversant with the state of the corn trade, that the averages are now tending to a point that will enable the holders of bonded corn to relieve it at a low duty, and, in case of a retarded harvest, or unfavourable weather, at the nominal duty of the Act. Speculation, accordingly, has been directed to corn under bond in preference to that on which the duty has been paid; and now, comparatively little distinction is made between that which is bonded, and that which is free, except in the case of barley, on which the duty is still high. Pease and beans are so scarce as to have risen in value during the last three months, between 40 and 50 per cent. But, for the prices in the dif-

ferent markets, we refer to our Tables, which will show the present state of the trade and the fluctuations that have taken place.

The same privation and diminution of consumption which we conceive to have operated upon the corn-markets, may be supposed to have affected the markets for live stock. Some time ago there was a great appearance of revival in the price, but the demand has again subsided. A continued improvement, however, has taken place in the price of English wool. This accords with the anticipations which we ventured to hold out as a probable consequence of the previous depression of the price of wool, the exhaustion of the stocks in hand, and of the improving state of the wool trade.

With regard to the prospects of the ensuing harvest, we are not yet enabled to speak favourably, notwithstanding that accounts are generally circulated of the appearance of luxuriance in many parts. This latter circumstance is frequently a consequence of a moist month of June, but it is remarked, that, in wet seasons with a low temperature, the return rarely corresponds with the bulk of the crop. The wheat is said to be, in most cases, small in the ear. The crops of barley and oats are more promising, although with large exceptions in the case of the latter crop, which in many places was much injured by insects in the early part of the season. The hay crop has been luxuriant, almost beyond example, especially in the southern parts of the island.

The distress of the agriculturists, to which it has been our painful duty periodically to advert, almost ever since the commencement of our labours, continue to be great, and, we fear, increasing. The favourable circumstances to which we had formerly occasion to advert, as connected with the general state of manufactures and trade, happily continue; but the influence of these has as yet only partially extended to the labouring classes, and scarcely at all to the landed interests. The advance which took place during the last spring in the price of corn was too late to be of much benefit to the growers, and the advance that has since taken place has been of still less importance to them. The farmers of this country may now be said to be suffering from the effects of four successive crops more or less deficient. The failure of the spring corn in 1826 affected many districts both of England and Scotland. In 1827, the general produce was below an average one; that of 1828 was still more so; and the result of the crop of 1829 has been even more severe in its consequences, generally speaking, than the three which preceded it. Even at the close of last harvest, the opinion generally entertained was, that the crop, if not a great, would at least be a fair one; and it was only as it came to be thrashed out that the real extent of the deficiency came to be known. This, added to the low scale of prices

which existed during the period of thrashing out, comes now to be felt with extraordinary severity, when the engagements which fall to be paid from the produce of that crop are in the course of fulfilment. It is seldom that, on the occurrence of a deficient crop, a rise of prices takes place sufficient to remunerate the grower for the deficiency. To do this, the rise must in every case be very great. But when a rise only a little above that of average years takes place, or when a greater rise taking place, it is not made fully available to the grower,—then the expenses of his cultivation remaining unaltered, the consequences are, as now, embarrassing and calamitous. It is for tenants, on entering into new engagements, to make their calculations of the future with prudence and forethought; and for landlords, in exacting the fulfilment of obligations contracted under more favourable circumstances, to take into a just and merciful account the claims of their suffering tenantry.

The proceedings of Parliament, now so abruptly terminated, are hardly otherwise remarkable, in so far, at least, as the landed interest is specially concerned, than for the quantity that has been spoken, and the little that has been done. The consequence of the retarded state of public business has been a hurried passing of various public measures which had been previously resolved upon, and amongst these the plans of finance brought forward by the Chancellor of the Exchequer. Some of these have, however, undergone great modification. The intention of laying a duty on home-made spirits, of one shilling a gallon in England, and twopence in Scotland, has been abandoned for the more equal tax of sixpence per gallon on all spirits, including rum. This is an improvement on the original measure. The relief of the West India planters, by a reduction of the duty on sugar, is a better mode of effecting the purpose, as we formerly endeavoured to show, than by bringing the produce of the colonies into collision and competition with that of the mother country.

Amongst the measures brought forward and abandoned in the past Session of Parliament, there is one to which we shall take an early occasion to direct the attention of our readers. This is the proposition brought forward under the sanction of the highest authority of the Church, for the commutation of Tithes. No tax has so long withstood the force of public opinion as this. It is not only a tax upon industry, but it is a tax of the worst kind, and upon the more valuable kind of industry; and it gives daily rise to more heart-burning and discontent, than any other burden which is laid upon the produce of capital and labour in this or any country. The progress of opinion begins to exert an influence upon this as upon other questions of public and domestic policy. We regret to say, however, that the measure now proposed, and

only lying over that it may be introduced again, is in nothing in accordance with public feeling. It is rather calculated to prolong the evil which it professes to remove, and by merely rendering it a little more tolerable, to disappoint the just expectations of the country. It were better that we should submit a little longer to the existence of the evil, in the confidence that it must ultimately give way to the progress of opinion and common sense, than that it should be extended for half a generation more by paltry and insufficient palliatives. In saying this, we do not mean to speak with irreverence of the venerable establishment of the Church of England, nor to question her right to a provision sanctioned by immemorial usage, and confirmed by innumerable laws. When we recur to this subject, we will endeavour to place the right of the church to this fund upon a better footing than some of its advocates have been ready to rest it. But, while we do not propose to question the right of the church, so long as it exists as a corporate body, to this fund, we assert the right of the state to assign to the church such an equivalent for this, or any other property, as shall seem just, and for the public good. This is founded upon a right as undoubted as that of the church to tithe, namely, the right of every succeeding generation of men to govern themselves, to abrogate hurtful laws, and to adopt such changes in their institutions as circumstances and the interests of the community shall require. If ever a tax required change, it is this. The grievance in the extent to which it has been suffered to exist in England, has no parallel in any other country.

Amongst other Parliamentary proceedings introduced, but leading to no result, were the intended resolutions of Lord Milton on the subject of the Corn-laws. We cannot conceive a purpose to be served by the periodical introduction of this agitating and irritating question at a time so unsuitable for further experiment as the present, and when there is little reason to suppose that, after so recent a settlement of the question, the parties interested will concur in a new adjustment of it. The present law has now been in operation only two years, or, if we take into account Mr Canning's temporary measure, little more than three years, a period surely sufficiently short to allow us to form a deliberate judgment on the tendency and practical operation of the measure. Lord Milton's resolutions conclude, that, "The existing regulations for the trade in corn do not prevent those fluctuations in its price, which are alike injurious to the cultivators of the soil, and to the consumers of agricultural produce." If Lord Milton supposes that any state to which the trade in corn can be reduced, can have the effect of preventing fluctuations in the price, we presume that he labours under a very erroneous conception of the nature of that trade. We are quite prepared to admit certain defects in the existing system, which would be obviated by

a fixed duty, while at the same time a large revenue might be secured to the state; but no change of this nature, we may rest assured, will prevent those fluctuations in price, which it is the object of Lord Milton's resolutions to provide against. To this subject, however, as well as to the general question of the corn trade, we propose at no distant time to return, when we shall perhaps have it in our power to dissipate some misconceptions which exist upon the subject. In the mean time we give the following official account of the quantity of Foreign Corn which has been imported and admitted for home consumption, since the year 1816, with the revenue derived. It shows that the resources of the exporting corn countries are greatly beyond what many seem to have once contemplated.

DATE.	Corn, Meal, and Flour Imported into the United Kingdom.			Corn, Meal and Flour entered for Home Consumption.		
	From American Colonies.	From other parts.	TOTAL.	From American Colonies.	From other parts.	TOTAL.
Year 1816,	Quarters. 3	Quarters. 319,215	Quarters. 319,218	Quarters. 1	Quarters. 326,746	Quarters. 326,747
... 1817,	28,847	1,813,134	1,841,981	28,847	1,796,691	1,825,538
... 1818,	56,618	2,486,242	3,542,860	56,618	3,440,512	3,497,130
... 1819,	14,257	1,697,223	1,711,480	12,733	1,244,824	1,257,557
... 1820,	40,897	1,301,306	1,342,203	32,200	729,279	761,479
... 1821,	40,916	216,808	257,724	...	80	80
... 1822,	23,439	102,923	126,362	...	560	560
... 1823,	209	53,657	53,866	12,137	225	12,362
... 1824,	890	611,704	612,594	15,777	661,418	677,195
... 1825,	95,220	965,617	1,060,837	128,493	705,932	834,425
... 1826,	30,579	2,221,692	2,252,271	32,291	2,066,653	2,098,944
... 1827,	61,220	2,561,063	2,622,283	61,712	2,937,154	2,998,866
... 1828,	21,600	1,272,778	1,294,378	23,098	1,214,396	1,237,494
... 1829,	7,335	2,687,097	2,694,432	4,671	1,954,684	1,959,355

AMOUNT OF REVENUE RECEIVED ON FOREIGN AND COLONIAL CORN, MEAL AND FLOUR, IN THE UNITED KINGDOM.

DATE.	From American Colonies.			From Other Parts.			TOTAL.		
	L.	S.	D.	L.	S.	D.	L.	S.	D.
Year 1816,	1	3	9	44	0	8	45	4	5
... 1817,	...	...	...	0	6	0	0	6	0
... 1818,	...	...	...	0	5	2	0	5	2
... 1819,	...	...	...	43	15	7	43	15	7
... 1820,	...	...	...	...	...	...	...	...	...
... 1821,	...	...	...	...	...	...	...	...	...
... 1822,	...	...	...	...	...	...	...	...	...
... 1823,	10,310	2	3	6	2	0	10,310	4	3
... 1824,	9,448	15	11	166,934	19	7	176,383	15	6
... 1825,	26,107	18	4	278,811	17	1	304,919	15	5
... 1826,	7,751	5	10	435,004	8	11	442,755	14	9
... 1827,	14,961	13	3	777,973	2	5	792,934	15	8
... 1828,	5,059	15	4	191,774	4	10	196,834	0	2
... 1829,	1,108	18	5	906,211	7	0	907,320	5	5

TABLES OF PRICES, &c.

The Average Prices of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets :—

LONDON.						
Date.	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.
1830.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Apr. 8.	68 8	32 4	33 8	34 0	33 0	35 0
12.	69 1	32 1	34 2	33 8	32 8	34 9
19.	68 3	32 4	34 7	34 6	33 2	35 6
26.	69 3	31 2	34 10	35 0	34 6	36 6
May 3.	68 5	32 1	35 6	36 6	36 0	36 0
10.	68 4	32 5	36 3	36 0	35 5	35 8
17.	67 6	32 8	36 7	35 6	35 0	35 2
24.	67 2	31 10	36 11	36 6	35 6	37 6
31.	65 10	32 3	37 0	36 4	35 4	37 2
June 7.	67 6	31 6	37 3	36 6	37 0	37 0
14.	66 3	30 0	37 5	36 0	36 6	37 6
21.	68 4	30 10	37 6	36 6	36 9	37 2
28.	69 1	29 9	37 4	37 0	37 0	37 8
July 5.	72 7	29 7	37 5	38 8	36 11	36 4
12.	72 2	29 8	37 3		35 9	37 6

HADDINGTON.						
Date.	Wheat.	Barley.	Oats.	Peas.	Beans.	
1830.	s. d.	s. d.	s. d.	s. d.	s. d.	
Apr. 2.	63 6	33 0	25 3	32 5	32 4	
9.	63 9	32 4	25 6	32 7	32 8	
16.	62 4	31 3	25 4	31 11	32 1	
23.	61 11	31 4	24 11	32 4	31 11	
30.	60 2	33 1	24 11	33 4	32 9	
May 7.	60 4	33 0	26 3	34 0	33 3	
14.	59 3	33 1	26 2	34 3	34 7	
21.	61 9	31 10	26 0	36 3	36	
28.	62 6	33 9	27 2	36 1	37 5	
June 4.	61 12	32 10	26 0	42 0	37 10	
11.	60 9	32 3	26 10	36 5	37 0	
18.	62 8	33 1	26 10	36 0	37 6	
25.	61 2	34 8	26 8	36 8	40 9	
July 9.	63 3	35 1	30 2	45 0	42 11	
16.	63 7	36 2	32 6	51 0	42 5	

LIVERPOOL.						
Date.	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.
1830.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Apr. 6.	65 0	31 3	34 2	32 0	32 2	33 6
13.	63 5	34 8	34 1	32 2	32 0	33 2
20.	64 9	30 9	34 1	32 6	32 2	33 6
27.	64 10	33 7	34 0	33 0	32 6	33 9
May 4.	64 1	37 5	34 4	34 0	33 2	34 0
11.	63 10	34 4	34 3	33 8	33 6	34 0
18.	61 8	31 1	33 11	33 2	32 10	33 6
25.	60 11	32 1	34 1	33 6	33 2	35 0
June 8.	62 7	30 11	34 9	33 2	34 0	35 2
15.	60 11	33 7	35 1	33 9	34 4	35 6
22.	61 7	31 5	35 4	33 6	34 6	35 4
29.	61 2	30 5	35 6	33 2	34 2	35 0
	64 3	32 0	36 9	34 0	34 8	35 4

EDINBURGH.						
Date.	Wheat.	Barley.	Oats.	Peas.	Beans.	
Apr. 7.	s. d.	s. d.	s. d.	s. d.	s. d.	
14.	67 8	33 6	35 9	34 0	34 1	
21.	68 4	35 6	36 6	34 6	34 8	
28.	68 3	35 6	36 7	34 6	34 8	
May 5.	64 6	34 7	36 0	35 6	36 0	
12.	64 7	33 1	36 7	36 0	36 4	
19.	63 7	34 6	36 8	36 6	37 5	
26.	64 7	34 8	36 8	37 2	37 1	
June 2.	64 3	35 2	37 6	37 8	38 1	
9.	62 5	34 3	38 6	38 7	38 10	
16.	64 9	35 0	37 7	38 6	40 0	
23.	63 7	35 6	38 3	39 10	40 0	
30.	61 3	36 0	39 7	40 0	40 2	
July 7.	62 8	36 6	39 0	40 0	40 2	
14.	67 1	36 6	31 2	40 3	40 5	

PRICES OF BUTCHER MEAT.

	SMITHFIELD. Per Stone of 14 lb.		MORFETH. Per Stone of 14 lb.		EDINBURGH. Per Stone of 14 lb.		GLASGOW. Per Stone of 14 lb.	
Date.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
April	5/6 @ 7/	5/9 @ 7/3	4/8 @ 6/	5/ @ 6/	4/8 @ 6/	4/9 @ 6/	5/ @ 6/	5/ @ 6/
May	5/9 7/3	5/6 7/9	5/ 5/9	5/6 6/6	4/6 5/6	5/6 6/3	5/ 5/6	5/ 5/6
June	5/3 7/	5/3 7/3	5/ 6/	5/6 6/9	5/ 6/	5/3 6/	5/ 6/	5/3 6/

PRICES of English and Scotch WOOL.

ENGLISH, per 16 lb.—*Marino*, Washed, 15/6 @ 21/6; in Grease, 10/6 @ 12/6.—*South Down*, 10/6 @ 16/6; *Leicester Hog*, 11/ @ 14/6; *Ewe and Hog*, 9/6 @ 12/6.—*Moor*, *Ewe and Hog*, 6/6 @ 8/6.

SCOTCH, per 16 lb.—*Leicester*, *Hog*, 15/0 @ 18/; *Ewe and Hog*, 12/6 @ 15/6.—*Cheviot*, *Hog*, 11/6 @ 13/6; *Ewe*, 10/6 @ 12/6.—*Moor*, *Ewe and Hog*, 4/ @ 6/.—*Cheviot*, laid per 24 lb., 10/6 @ 12/6.—*Moor*, 5/0 @ 7/0.

TABLE showing the Weekly Average Prices of all kinds of GRAIN, made up in terms of the 7th and 8th Geo. IV. c. 53, and the Aggregate Averages of the six weeks which regulate the Duties payable on FOREIGN CORN; and the Duties payable thereon.

Date.	Wheat.			Barley.			Oats.			Rye.			Beans.			Peas.		
	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.
1830.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Jan. 1.	56	56	11 30	8 29	6 39	3 16	10 21	4 21	7 15	3 33	3 32	2 21	9 32	7 34	8 18	3 36	6 37	8 14
8.	55	56	8 30	8 29	8 29	10 18	4 21	8 21	6 15	3 30	7 31	10 22	9 32	7 34	8 18	3 35	6 37	8 14
15.	56	56	7 30	8 29	6 29	8 18	4 21	5 21	5 15	3 32	6 31	9 22	9 32	3 33	5 19	9 34	11 36	9 15
22.	56	56	5 30	8 29	6 29	7 18	4 21	8 21	6 15	3 31	11 31	9 22	9 31	9 32	10 21	3 35	11 36	3 15
29.	56	56	3 30	8 29	4 29	6 18	4 21	1 21	5 15	3 36	9 32	10 21	9 31	3 32	3 21	3 35	2 35	11 16
Feb. 5.	56	56	1 30	8 29	4 29	5 18	4 20	9 21	3 15	3 33	6 33	0 19	9 31	4 31	10 22	9 34	7 35	5 16
12.	56	56	1 30	8 29	2 29	5 18	4 21	0 21	3 15	3 33	5 33	0 19	9 31	4 31	7 22	9 35	1 35	2 16
19.	57	56	5 30	8 29	2 29	4 18	4 20	7 21	1 15	3 33	2 33	5 19	9 30	5 31	4 22	9 36	0 35	3 16
26.	58	4 56	9 30	8 29	3 29	3 18	4 21	4 21	0 15	3 34	11 33	10 19	9 31	2 31	2 22	9 35	0 35	3 16
Mar. 5.	59	1 57	3 29	8 38	11 2	2 18	4 21	1 30	11 16	9 34	7 34	3 18	9 30	9 31	0 22	9 35	7 35	2 16
12.	59	11 57	11 29	8 28	7 29	6 18	4 21	7 21	2 15	3 37	3 34	6 18	9 30	11 30	11 24	3 35	5 35	3 16
19.	60	8 58	7 28	8 29	6 29	6 18	4 21	7 21	2 15	3 37	3 34	6 18	9 31	11 30	10 24	3 35	4 35	4 16
26.	61	2 59	4 27	8 29	5 29	6 18	4 21	11 21	4 15	3 34	4 34	6 18	9 31	4 30	10 24	3 35	10 35	6 16
Apr. 2.	62	9 60	3 26	8 29	10 29	2 18	4 22	4 21	7 15	3 36	4 35	2 16	9 31	11 31	1 22	9 35	9 35	5 16
9.	63	1 61	5 25	8 31	1 29	5 18	4 22	11 21	10 15	3 34	3 35	1 16	9 33	5 31	6 22	9 35	2 35	6 16
16.	63	3 62	7 24	8 31	8 29	11 18	4 23	3 22	3 13	9 34	0 35	0 16	9 33	3 31	11 22	9 35	5 35	5 16
23.	66	1 63	8 32	8 31	8 30	5 16	10 23	6 22	7 13	9 36	10 35	6 16	9 34	6 32	6 21	3 36	5 35	7 16
30.	66	5 64	7 22	8 31	5 30	10 16	10 23	9 22	11 13	9 34	1 34	11 18	9 34	8 33	2 19	9 36	9 35	10 16
May 7.	65	11 65	5 21	8 31	10 31	3 15	4 24	2 23	3 12	3 36	4 35	3 16	9 35	11 33	11 19	9 35	10 35	10 16
14.	66	6 66	0 20	8 32	0 31	7 15	4 35	1 23	9 12	3 36	1 35	3 16	9 35	6 34	6 18	3 36	9 35	11 16
21.	65	4 66	1 20	8 32	2 31	9 15	4 35	3 24	2 10	9 35	3 35	5 16	9 35	11 34	11 18	3 36	6 36	0 15
28.	65	2 65	10 21	8 31	5 31	9 15	4 35	7 24	6 10	9 37	4 35	11 16	9 35	11 35	4 16	9 38	2 36	6 15
June 4.	65	10 65	10 21	8 31	5 31	8 15	4 26	6 24	11 10	9 35	6 35	9 16	9 35	5 35	5 16	9 36	0 36	5 15
11.	65	11 65	9 21	8 30	11 31	7 15	4 26	6 25	5 9	9 36	2 36	1 15	9 36	10 36	1 15	6 37	0 36	6 15
18.	65	8 65	8 21	8 31	1 31	6 15	4 26	5 25	9 9	9 35	5 35	11 16	9 36	4 36	1 15	6 37	7 36	9 15
25.	66	5 65	8 21	8 31	1 31	4 15	4 26	6 26	0 7	9 36	11 36	1 15	9 36	9 36	4 15	6 36	10 36	11 15
July 2.	67	5 65	0 20	8 31	0 31	1 15	4 26	7 26	3 7	9 38	3 36	7 15	9 36	10 36	6 15	6 37	8 37	2 14
9.	68	6 66	7 20	8 31	0 31	1 15	4 27	1 26	6 7	9 38	8 36	10 15	6 37	3 36	8 15	6 39	5 37	5 14

SUPPLEMENT to FIARS for Crop 1829.

ARGYLE.

	Imp. Qr.	Boll.
Barley,	26/	19/6
Oats,	22/	16/6
Oatmeal, 140 lb.		17/6

CAITHNESS.

	Imp. Qr.	Boll.
Barley,	26/3d	20/
Oats, Potato,	21/6d	17/
Angus,	20/3	16/
Dun,	20/3	16/
Black,	15/3d	12/
Oatmeal,	140 lb 14/0d	18/6 q 8 1/2 st.

KINROSS.

	Imp. Qr.	Boll.
Wheat,	49/	24/6
Barley, Best,	27/6	20/
Second,	25/	18/3
Oats, White, Best,	21/9	15/10
Second,	19/	13/10
Black, Best,	19/	13/10
Second,	16/4	12/
Peas and Beans,	29/9	14/10
Oatmeal, per 280 lb,	33/	16/6

The MONTHLY RETURNS, published in terms of 8th Geo. IV. c. 60, showing the quantities of Corn, Grain, Meal, and Flour imported into the United Kingdom in each month; the quantities upon which duties have been paid for home-consumption, during the same month; and the quantities remaining in warehouse at the close thereof: from 1st January to 1st March 1830.

Month ending	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN WAREHOUSE.		
	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.
Jan. 1. 1830.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, . . .	22,146 7	2617 3	24,764 2	129 0	1168 7	1,297 7	227,157 5	1495 4	228,653 1
Barley, . . .	6,094 2	..	6,094 2	502 1	..	502 1	65,066 6	..	65,066 6
Oats, . . .	7,440 1	..	7,440 1	881 6	..	881 6	443,448 0	..	443,448 0
Rye, . . .	2,650 6	..	2,650 6	6 4	..	6 4	26,434 6	..	26,434 6
Peas, . . .	384 1	814 4	1,198 5	5,480 4	814 4	6,295 0	10,207 1	..	10,207 1
Beans, . . .	177 5	..	177 5	179 2	..	179 2	2,556 4	..	2,556 4
Maise, . . .	2 3	..	2 3	2 3	..	2 3	1,298 5	..	1,298 5
Buckwheat, . .	1 3	..	1 3	23 5	..	23 5	2,230 4	..	2,230 4
Totals, .	38,907 4	3431 7	42,339 3	7,205 1	1063 3	9,168 4	779,430 7	1495 4	780,925 3
Wheatmeal, or Flour, Oatmeal, and other sorts, . . .	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
	10,997 3 20	127 3 0	11,125 2 20	89 0 19	232 3 0	321 3 19	62,462 2 5	576 0 7	63,038 2 12
Totals, .	10,997 3 20	129 2 6	11,127 1 26	89 0 19	234 2 6	323 2 25	62,462 2 5	576 0 7	63,038 2 12
Feb. 1.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, . . .	11,041 6	3552 2	13,594 0	359 0	1255 5	1,614 5	236,446 4	2792 1	239,238 5
Barley, . . .	549 4	..	549 4	..	..	..	65,809 1	..	65,809 1
Oats, . . .	112 6	0 4	113 2	340 1	0 4	340 5	441,967 2	..	441,967 2
Rye, . . .	..	..	..	..	..	..	26,434 6	..	26,434 6
Peas, . . .	5 4	463 7	469 3	672 4	339 5	1,012 1	9,269 6	154 2	9,424 0
Beans, . . .	338 3	..	338 3	4 0	..	4 0	2,865 3	..	2,865 3
Maise, . . .	1 1	..	1 1	1 4	..	1 4	1,187 2	..	1,187 2
Buckwheat, . .	0 1	..	0 1	6 3	..	6 3	2,339 7	..	2,339 7
Totals, .	12,049 1	3046 5	15,095 6	1,383 4	1505 6	2,979 2	786,339 7	2946 3	789,286 2
Wheatmeal, or Flour, Oatmeal, and other sorts, . . .	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
	7,303 3 23	6 3 0	7,310 2 23	38 0 13	111 3 0	149 3 13	66,491 2 23	471 0 7	66,962 3 2
Totals, .	7,372 0 17	6 3 0	7,378 3 17	38 0 13	111 3 0	149 3 13	66,501 1 23	471 0 7	66,972 3 2
March 1.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, . . .	3,502 5	110 7	36,113 4	123 3	257 1	380 4	238,007 7	2632 6	240,640 5
Barley, . . .	72 2	..	72 2	72 2	..	72 2	65,151 1	..	65,151 1
Oats, . . .	9 5	..	9 5	2 3	..	2 3	437,689 2	..	437,689 2
Rye, . . .	..	..	..	4 6	..	4 6	26,430 0	..	26,430 0
Peas, . . .	57 0	69 4	156 4	91 1	69 4	160 5	9,247 7	154 2	9,401 1
Beans, . . .	41 4	..	41 4	41 4	..	41 4	2,680 3	..	2,680 3
Maise, . . .	6 5	..	6 5	6 5	..	6 5	1,187 2	..	1,187 2
Buckwheat, . .	..	..	..	16 0	..	16 0	2,117 3	..	2,117 3
Totals, .	3,719 5	180 3	3,900 0	358 0	326 5	684 5	783,810 1	2787 0	786,597 1
Wheatmeal, or Flour, Oatmeal, and other sorts, . . .	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
	17,494 3 4	21 3 14	17,506 2 18	54 3 15	16 2 14	71 2 1	81,631 3 13	476 1 7	82,107 3 20
Totals, .	17,494 3 4	21 3 14	17,506 2 18	54 3 15	16 2 14	71 2 1	81,633 2 13	476 1 7	82,109 3 20

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, showing the quantities of Corn, Grain, Meal, and Flour imported into the United Kingdom, in each month; the quantities upon which duties have been paid for home-consumption, during the same month; and the quantities remaining in warehouse at the close thereof: from 1st April to 1st June 1830.

Month ending	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN WAREHOUSE.		
	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.
<i>April 1.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>
Wheat, . . .	4,098 1	36 0	4,131 1	24 1	214 2	238 3	237,596 5	2454 4	240,151 1
Barley, . . .	0 1	..	0 1	7 4	..	7 4	66,626 2	..	66,626 2
Oats, . . .	2 1	..	2 1	95 4	..	95 4	429,307 5	..	429,307 5
Rye, . . .	..	..	..	..	..	..	26,431 1	..	26,431 1
Peas, . . .	0 5	4 6	5 3	4 0	30 7	34 7	9,267 4	128 1	9,395 5
Beans, . . .	..	..	..	..	..	..	2,600 3	..	2,600 3
Maise, . . .	0 6	..	0 6	0 6	..	0 6	1,184 1	..	1,184 1
Buckwheat, . . .	..	..	..	..	..	..	2,117 3	..	2,117 3
Totals, . . .	4,098 6	40 6	4,130 4	131 7	245 1	377 0	775,511 0	2582 4	778,093 5
Wheatmeal, or Flour, Oatmeal, and other sorts, . . .	cwt. qr. lb. 28,538 3 21	3 2 14	cwt. qr. lb. 28,542 2 7	cwt. qr. lb. 85 1 9	3 2 14	cwt. qr. lb. 88 3 23	cwt. qr. lb. 105,310 3 17	cwt. qr. lb. 474 3 7	cwt. qr. lb. 105,785 2 24
Totals, . . .	28,538 3 21	4 1 1	28,543 0 22	85 1 9	4 1 1	89 2 10	105,316 0 11	474 3 7	105,790 3 18
<i>May 1.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>
Wheat, . . .	46,629 5	0 5	46,630 2	7,397 7	356 6	7,754 5	276,343 1	2098 3	278,441 4
Barley, . . .	1,767 4	..	1,767 4	0 3	..	0 3	68,375 2	..	68,375 2
Oats, . . .	15 3	..	15 3	22 7	..	22 7	426,329 6	..	426,329 6
Rye, . . .	1,540 1	..	1,540 1	..	..	..	27,418 7	..	27,418 7
Peas, . . .	382 2	..	382 2	360 3	128 1	488 4	9,284 1	..	9,284 1
Beans, . . .	..	..	..	0 3	..	0 3	2,672 4	..	2,672 4
Maise, . . .	409 1	..	409 1	..	..	..	1,693 2	..	1,693 2
Buckwheat, . . .	102 7	..	102 7	27 5	..	27 5	1,223 6	..	1,223 6
Totals, . . .	50,846 7	0 5	50,847 4	7,809 4	484 7	8,294 3	813,440 5	5098 3	815,539 0
Wheatmeal, or Flour, Oatmeal, and other sorts, . . .	cwt. qr. lb. 33,655 0 21	cwt. qr. lb. 3 2 14	cwt. qr. lb. 33,656 0 21	cwt. qr. lb. 30 1 5	cwt. qr. lb. 17 2 0	cwt. qr. lb. 47 3 5	cwt. qr. lb. 136,309 3 14	cwt. qr. lb. 457 1 7	cwt. qr. lb. 136,767 0 21
Totals, . . .	33,655 3 7	..	33,656 3 7	31 3 19	17 2 0	40 1 10	136,315 0 8	457 1 7	136,772 1 15
<i>June 1.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>	<i>Qrs. Bu.</i>
Wheat, . . .	247,111 2	474 3	247,585 5	228,423 4	472 3	228,895 7	225,107 4	2100 3	227,207 7
Barley, . . .	15,598 1	..	15,598 1	376 3	..	376 3	80,272 1	..	80,272 1
Oats, . . .	5,130 0	..	5,130 0	170 2	..	170 2	430,332 6	..	430,332 6
Rye, . . .	328 2	..	328 2	13 2	..	13 2	27,415 6	..	27,415 6
Peas, . . .	2,088 4	..	2,088 4	734 0	..	734 0	10,453 2	..	10,453 2
Beans, . . .	4,163 5	..	4,163 5	29 4	..	29 4	7,017 1	..	7,017 1
Maise, . . .	1 0	..	1 0	184 2	..	184 2	979 6	..	979 6
Buckwheat, . . .	0 1	..	0 1	34 5	..	34 5	480 4	..	480 4
Totals, . . .	274,414 7	474 3	274,889 2	229,985 6	472 3	230,458 1	852,656 6	2100 3	854,756 1
Wheatmeal, or Flour, Oatmeal, and other sorts, . . .	cwt. qr. lb. 100,081 3 28	cwt. qr. lb. 3 3 21	cwt. qr. lb. 100,085 3 19	cwt. qr. lb. 66,496 3 21	cwt. qr. lb. 236 2 21	cwt. qr. lb. 66,733 2 14	cwt. qr. lb. 173,059 3 24	cwt. qr. lb. 224 2 7	cwt. qr. lb. 173,284 2 3
Totals, . . .	100,086 2 16	3 3 21	100,210 2 9	66,496 3 21	236 2 21	66,733 2 14	173,154 0 23	224 2 7	173,378 3 2

An ACCOUNT of the Net Public Income of the United Kingdom of Great Britain and Ireland, in the year ended the 5th January 1830, after abating the Expenditure thereout, defrayed by the several Revenue Departments.

INCOME.

I. ORDINARY REVENUES AND RECEIPTS.

Customs,	£ 17,211,839	19	6½
Excise,	19,540,010	19	11½
Stamps,	7,101,304	13	5
Taxes,	4,896,567	10	6½
Post Office,	1,481,000	0	0
1s. 6d. and 4s. on Pensions and Salaries,	54,493	1	11½
Hackney Coaches, and Hawkers and Pedlars,	61,167	1	10
Small branches of the King's hereditary Revenues,	6,632	5	0
Surplus Fees of regulated Public Offices,	66,372	15	0½
Poundage Fees, Pells' Fees, &c. in Ireland,	8,886	14	8½
	£ 50,428,275	1	11½

II. OTHER RECEIPTS.

Imprests, and other moneys,	212,550	15	11
Money received from the East India Company,	60,000	0	0
Do. received from the Bank on account of unclaimed dividends,	81,404	7	8
Do. brought from the Civil List, on account of the Salary of the Lord Warden of Cinque Ports,	3,452	0	3
Do. do. on account of the Clerk of the Hanaper,	1,000	0	0

TOTAL NET INCOME, £ 50,786,682 5 9½

EXPENDITURE.

I. FUNDED DEBT.

Interest and management of the Permanent Debt,	£ 25,672,555	15	1½
Terminable Annuities,	2,604,562	3	5½
	£ 28,277,117	18	6½

II. UNFUNDED DEBT.

Interest on Exchequer Bills,	878,494	1	3½
	£ 29,155,611	19	10
Civil List,	1,057,000	0	0
Pensions,	378,691	16	10½
Salaries and Allowances,	71,257	16	8
Courts of Justice,	148,021	15	6½
Mint Establishment,	14,633	0	0
Bounties granted for the encouragement of the growth of Hemp and Flax in Scotland, per Act 27th Geo. III. c. 13. § 65,	2,956	13	8
Miscellaneous charges upon the Consolidated Fund,	202,470	3	8
*Payments out of Consolidated Fund, Ireland, under various Acts of Parliament,	377,968	12	5½
Army,	7,709,372	6	9
Navy,	5,902,339	1	8
Ordnance,	1,569,150	0	0
Miscellaneous, chargeable upon annual grants of Parliament,	2,485,660	12	4
	49,075,133	19	5½
Surplus of Income or Revenue over Expenditure,	£ 1,711,548	6	3½

FOREIGN CORN MARKETS.

THE advance which has taken place in corn in this country, and the consequent prospect of a material decline in the rate of duties, have occasioned great animation in all the Continental markets; and extensive business has been done in every description of corn, though chiefly in wheat and oats. Barley, too, has attracted attention, but not to the same extent, in consequence of the high rate of duty still exigible in this country. The shipments from the Continent are now gradually arriving, and the early purchases now yield the importer 30, 40, and 50 per cent.

We give the following particulars of what has been passing from advices which we have received from time to time during the last three months.

HAMBURG.—The supplies of wheat diminish, and a lively and extensive demand has been experienced during the last month, and all that has appeared has been rapidly taken off at advancing rates. Fine yellow Saale quality brings 41/, the weight being about 61 lb $\frac{1}{2}$ bushel.

Rye and barley continue inquired for, but they do not advance in proportion to wheat—fine Saale Malting 18/ $\frac{1}{2}$ quarter. Oats have been in constant demand, and the qualities from the Danish islands, weighing from 38 lb to 39 lb $\frac{1}{2}$ bushel, readily command 11/6 to 12/ free on board.

Beans and peas are much in demand, but extremely scarce.

Prices.

Wheat,	-	-	38/ @ 44/	Oats,	-	-	12/ @ 13
Rye,	-	-	23/ @ 24/	Beans,	-	-	23/ @ 24/
Barley,	-	-	18/ @ 21/	Peas,	-	-	25/ @ 27/

The reports of the rapeseed crop continue improving, without, however, there being any expectation of more than half a crop. Rapeseed is in constant demand.

COPENHAGEN.—The cold state of the atmosphere, which has prevailed almost throughout the whole season, has retarded vegetation in an unusual manner; and great alarm is now entertained for the coming crop, unless the weather very shortly becomes milder. Speculation is alive, and holders are so firm that few will name a price; and the smallness of stocks makes it difficult to effect purchases even at high rates. No oats are left, and very little barley.

Prices.

Wheat,	-	-	34/ @ 37/	Barley,	-	-	13/6 @ 15/6
Rye,	-	-	21/ @ 23/	Oats,	-	-	13/ @ 15/6

KIEL.—Our prices for all sorts of grain rule high, and good qualities are very scarce. The weather continues very unseasonable, with cold nights and unremitting showers of rain, which produce very bad effects on the growing crops.

Prices.

Wheat,	-	-	35/ @ 39/	Oats,	-	-	13/ @ 15/
Barley,	-	-	15/ @ 16/				

ROSTOCK.—This market is unusually bare of wheat, and no supplies of any moment are expected. The weather has been throughout most ungenial, and the greatest fears are entertained for the coming crop.

Prices.

Wheat,	-	-	38/ @ 42/	Oats,	-	-	13/ @ 16/
Barley,	-	-	15/ @ 17/	Peas,	-	-	24/ @ 26/

DANTZIG.—The business done in this market has been of a very extensive nature; and the accounts from Britain being encouraging and the weather continuing unseasonable, prices keep continually on the advance.

Very large unlimited orders arrive from England, and, in addition to this, extensive purchases have been made for France and Holland. The stocks are greatly reduced, and are smaller than they have been at any period during the last ten years. The greater part of the expected Polish supplies have arrived. For rye the demand has been very brisk; and prices having already reached 18/ @ 20/ in Poland, nothing can be expected from thence.

Prices.

Wheat,	-	-	48/ @ 58/ @ 60/	Oats,	-	-	13/ @ 15/
Rye,	-	-	22/ @ 25/	Peas,	-	-	24/ @ 26/
Barley,	-	-	14/ @ 16/				

RIGA.—In consequence of the reports from Denmark and the northern provinces of Germany, rye has been in great demand here, and much higher prices are realized. Very little Courland good wheat is left, and Polish wheat commands high prices, say 36/ @ 38/ @ 40/ $\frac{1}{2}$ quarter.

No stock of barley remains of any consequence, and good Courland has advanced to 17/ $\frac{1}{2}$ quarter. The advance in oats in the London market has had some influence on prices, and now good 37 lb qualities are held at 16/.

Prices.

Wheat,	-	36/ @ 38/ @ 40/	Barley,	-	16/ @ 17/ @ 18/
Rye,	-	18/ @ 20/ @ 22/	Oats,	-	15/ @ 16/ @ 16/6

THE
QUARTERLY
JOURNAL OF AGRICULTURE.

ON THE LAWS FOR THE REGULATION OF THE HERRING-
FISHERY.

No branch of industry has received so much encouragement from Government, and none has repaid the encouragement so ill, as the Herring-fishery. Acts and regulations have been framed, boards and bounties established, and all the wisdom of detail legislation expended in promoting the British herring-fishery; and yet the British herring-fishery will not be promoted. The cooper hoops his herring-barrel according to act of Parliament, the fishwife guts her herring in the act of Parliament way, the fish curer salts his fish, not to suit his customers, according to his own judgment and experience of his market, but according to the orders of the Board for promoting our fisheries, in strict conformity to their rules, and under the superintendence of their officers: yet is all this wisdom, and interference, and expense, thrown away. The curing of herrings in Great Britain continues to be a very unsound branch of trade; one in which few people of capital choose to embark, or, if they do embark in it, find any regular gains, at all adequate to their trouble and risk of capital. Fish-curing, in short, is almost proverbially an uncertain trade, which is always in the extreme of over production, or of short production. What is the cause of this? It appears very extraordinary that a branch of industry, depending upon the demand for a common kind of food, of which the supply is not more affected on the whole by bad seasons or bad weather, than the supply of any agricultural produce, should be so irregular and unsteady. It appears ex-

traordinary, that demand and supply in that most simple of articles, salted fish, should to this day be unadjusted. In the explanation of this anomaly, and in the history of our herring-fishery, we may read a useful lesson on the bounty system,—on the folly of encouragement to production beyond the demand or consumption,—on the absurdity of Government interference and regulation, in matters which the self-interest of those concerned can regulate much better. It is precisely because Government will encourage the herring-fishery, that the herring-fishery is not in a sound and thriving state; that supply and demand in this trade stand in no natural relation or proportion to each other. It is worth going into the detail of this subject. It is a practical illustration of the principle, that the interference of Government, in matters of supply and demand, is always evil, always counteracts the very object in view.

The cost of production of a barrel of cured herrings, allowing the fisherman a fair price for the green fish, is about 16s. The fisherman would have 8s., and the other 8s. will cover the ordinary expense of the barrel, salt, and labour. Government, until lately, gave a bounty of 4s. per barrel of cured herrings. One-fourth of the capital employed in the production of cured herrings, was, therefore, given by Government. Government was the great fish-curer, and evidently was in the way of, and counteracting, every private fish-curer working on his own capital, because, in every market to which he could send his fish, every fourth barrel at market was, in point of fact, provided gratis by Government. The effect of this bounty was of course the production of a much greater quantity of cured fish, in some seasons, than the markets required or could consume; this over-production necessarily produced a re-action, as people do not long follow a losing trade; and the markets, after consuming, at less than prime-cost, the surplus of fish thrown into them, gradually recovered a natural state, to be again glutted by an over-supply, promoted by the bounty. The operation of the bounty in producing an over-supply, and its effects on the fish-curiers and fishermen, were these: Every man who could put together a barrel, became a fish-curer; because, upon the credit of the bounty, he could lay in the stock of staves, hoops, and salt, he required. The two-thirds of the

prime-cost of these raw materials of his trade were paid by Government ; and, however the poor fisherman might ultimately be paid for the fish he delivered, the stave-merchant and salt-merchant were sure of finding in the barrels, full or empty, what would pay them. The great number of fish-curers thrown into the trade by this temptation, of having almost all the capital they required given to them by Government, necessarily produced over-trading. Great prices were paid for the green fish to fill the curers' barrels, and obtain the bounty. If the fish sold at a price to pay every one with the help of the bounty, all was well ; if not, the fisherman was the loser. The competition among the curers, coming in fact upon Government capital, occasioned bargains with the fishermen at 15s. or 16s. for the quantity of green fish that would fill a barrel, when the markets, at the same time, were so glutted, that the barrel of cured herrings was not worth the money. The effect of the bounty on the fish-curers fairly trading upon their own capitals, was in every way prejudicial. The consequences to the class of fishermen, whom it was the main object of Government to favour and encourage by the bounty system, were most injurious. One year the price of the green fish would be 16s. or 18s., and the next year 7s. or 8s. One year a boat's crew would make L. 200 Sterling of their six weeks' fishing, and another year, with an equal quantity of fish, and equal exertions, they would not make L. 40. These vicissitudes of income produce great moral evil among the labouring classes. It makes their livelihood a kind of gambling. The number of new boats fitted out every year, was very far from being a proof of the prosperity or increase of that class of fishermen whom it was the object of Government to benefit by the bounty system. The greater number by far of these boats never touch the water but during six weeks, from the middle or end of July to the middle of September. They are owned and sailed, not by regular fishermen following that vocation only, but by tradesmen, small farmers, farm-servants, and other landmen, who may have sufficient skill to manage a boat at that season, but who do not follow the sea, except for the six weeks of the herring-fishery, when they go on a kind of gambling speculation, of earning a twelvemonth's income by six weeks' work. The encour-

agement of the class of fishermen on our coasts, as an excellent nursery for seamen, is the good old-fashioned argument in favour of the bounty system. It was for this, and for this alone, that the Fishery Board, and its machinery, was first established, and now exists. Will the Board explain to the public what encouragement it is to any class of men to tempt more people into their trade than their trade requires? What encouragement is it to regular sea-going fishermen, following no other trade, to bring all the population of the neighbouring countries into competition with them, for six weeks in summer? Would it be an encouragement to the class of shoemakers, to set all their neighbours a shoemaking for six weeks in the year; and to give their customers every fourth pair of shoes they required for nothing? What encouragement can it be to any trade, to force a supply of its productions into the market beyond the demand? If the Fishery Board had consumed, had eaten and digested, every fourth herring they paid for, and sent to market by the operation of the bounty, that, to be sure, would have been a real and intelligible encouragement of the herring-fishery. Consumption and production would have been visibly going on together, in the way they must do in every sound and judicious system, adopted for the encouragement of any branch of industry. Without this natural balance between production and consumption, all is but show and humbug as to the real progress of a trade, however much it may be fostered by bounties. There is no forcing mankind to buy and eat more of an article than they want. The great object, however, of the Fishery Board, the end and aim of its regulations and bounties, was to force a market on the Continent, for the surplus of fish produced by the bounty. Let us consider a little closely the wisdom of such an attempt, and its applicability to our British herring-fishery.

From the accession of King James to the British Crown to the present day, not twenty, perhaps not ten years together, have elapsed, without some new enactment of the Legislature, or some joint-stock association of individuals, bolstered up by the special protection of Government, for the more effectual prosecution of the herring-fishing. The cause of the strong predilection for this branch of industry, not only in this country, but

in every country which has a port in the North Sea, was probably the great and successful struggle of the Dutch against the mightiest of European powers, the most remarkable, and, in its consequences, the most important event of modern history, which naturally turned the minds of men to consider the means by which this handful of people had been enabled to oppose the vast resources of the Spanish monarchy. One branch of industry almost as exclusively in the hands of the Dutch at that time as their spice-trade, was the herring-fishery. We are prone to exaggerate the advantages of which we do not partake; and to those two branches of trade, a degree of importance was attributed, not merely by the vulgar, but by enlightened statesmen, to which, perhaps, as main sources of national wealth, they were not, in reality, entitled. Considerable and beneficial branches of trade, no doubt, they were; but they certainly were not of that importance and extent of which they were estimated to be by contemporary writers. With all the diffusion of luxury in the present day, and the approximation between the different classes of society, in habits, tastes, and way of living, the whole spice-trade of Europe, the total value of cinnamon, mace, nutmegs, cloves, and other spiceries imported and used in Europe, would not be considered as an important branch of trade, on which the wealth and resources of a country principally depended; but merely as a lucrative trade, for the few vessels and people engaged in it. The herring-fishery of the Dutch, important and extensive as it undoubtedly was, has probably been, in the same degree, exaggerated and magnified by the most sober-minded writers, and by the Dutch themselves. That Amsterdam is founded upon herring-bones, passed into a proverb among them, and what was applicable to the village, or little fishing town on the Zuyder Zee, was applied to the city when she was empress of the ocean. According to an estimate of the population of the United Provinces, published in Holland in 1669, the number of persons employed as fishermen, or in equipping fishermen with ships, boats, nets, tackle, salt, &c. is stated to be 450,000. The total population of the United Provinces, including these 450,000 persons, is, by the same statement, reckoned to be only 2,400,000; so that nearly every fifth person, of every

age and sex, including the most aged, and the sucking babes, the wives, mothers, and daughters, as well as the men and boys, was either in the North Sea fishing herrings, or weaving canvas, building ships, making nets, or engaged in other occupations connected with the herring-fishery. The extravagance of such a statement is its best refutation; but in political science, the extravagance of a statement appears very often to be no hinderance to its being generally received. Reducing the 2,400,000 people in the United Provinces into their ages and sexes, there would only, according to the best calculations made upon the population, be 600,000 persons between the ages of eighteen and fifty-six in such a population; and one half of these would be females. The Dutch writer perhaps reckoned, that if the ladies were breeding fishermen, they might be reckoned among his 450,000 persons engaged in the fishery.

During the last two centuries, every country in Europe which has access to the North Sea, has been framing ordinances and regulations for promoting its herring-fishery, and for having, as well as Holland, its half a million, or so, of fishermen, and outfitters of fishermen, employed in this branch of industry. Great Britain has, about every twenty years, her periodical return of this herring fever. The ordinary symptoms with us are, a great deal of talking in and out of Parliament, about a mine of wealth upon our own coast, which we allow our neighbours to work; of a nursery of hardy seamen for our navy, which we suffer to languish; of an inexhaustible source of national industry and wealth which we neglect, and all from want of due encouragement and regulation. Then spring up joint-stock national fishing companies; and fishery-boards, bounties, and regulations without end, are established. The quackery ends at last by the patient paying for all. About forty years ago, during a paroxysm of this disorder, a National Society for extending our fisheries was framed. His late Majesty was named patron of the undertaking. Large sums were subscribed, and a joint-stock capital was formed for carrying on the deep-sea herring-fishery, and building fishing villages in the Highlands of Scotland. For a season or two, busses were fitted out by the society; but, if every herring caught had carried a ducat in its mouth, the expense of its capture would scarcely have been re-

paid. The bubble ended by the society for fishing in the deep-sea becoming a kind of building society, for purchasing ground in situations where curers and fishermen find it convenient to settle ; and selling or letting it in small lots to them, at such an advance of price as yields something better than fishing profits. About twenty years after this society for extending our deep-sea fishery had run aground, the late Right Honourable George Rose was attacked by a slight access of this herring fever, to which the most eminent statesmen have at times been subject. An act of Parliament was passed, appointing six gentlemen of Edinburgh a board of commissioners for regulating the herring-fishery, and giving the force of law to such rules and enactments as the Board might, from time to time, issue. A sufficient number of fishing officers, with of course sufficient salaries (not much exceeding the half-pay of captains in the navy), were necessarily employed to see those rules and enactments duly conformed to in the curing of herrings. It is not easy to conceive what concatenation of ideas could have associated in the Right Honourable Gentleman's mind, the rightful gutting, packing, and pickling of herrings, with the calling and vocation of the Lord Advocate of Scotland, or with the daily business of the eminent Edinburgh bankers, of whom principally he composed his board. The previous personal occupations of the gentlemen appointed by the Act of Parliament to frame regulations for the catching and curing of herrings, had certainly not been such as to give them the slightest acquaintance with the subject ; and as their services were gratuitous, and consequently without responsibility, it is not unfair to suppose, that, whatever was suggested by any one of their number who may have bestowed a little attention on the subject, was adopted and approved of by the Board without further consideration. It is matter of astonishment, that, with so much room to go wrong, this Board did not go farther wrong than it has done. It is the principle itself upon which the Board is founded, and from which its regulations, restrictions, bounties, penalties, and superintendence, spring, that is inconsistent in itself, erroneous, and prejudicial to the British herring-fishery. The machinery by which the system is supported, that is, the regulations, restrictions, bounties, penalties, and superintendence, however ingenious and

well calculated for the object in view, must be condemned, if the system itself is founded on false principles, and its object in error.

The Dutch have long been acknowledged as superior in the art of curing herrings to any other nation. The barrel of Dutch herrings will bring double, or even three times the price of British herrings, in every market of Europe. The fundamental error of the principle on which our Fishery-Board is founded, and has proceeded, is, that we ought to endeavour, by regulations, bounties, and superintendence, to bring our cured herrings to an equality with those of the Dutch, and to compete with them in the European markets. A very little consideration of the difference of circumstances will show the futility of such an endeavour; and that, if it could be effected, it would not be of advantage to our herring-fishery, or tend, in any degree, to the great object of increasing our seafaring population engaged in that fishery. The manufacturer of salt-herrings, like every other manufacturer, must prepare his goods to suit his customers. The customers whom the Dutch have to please, are the opulent peasantry and citizens who inhabit the Low Countries, and the interior of Germany, and who consume the Dutch herrings as an article of luxury—as a delicacy, rather than as an article of subsistence. The fish are, accordingly, prepared as a delicacy with the utmost care; the curer's profit depending upon the quality as much as, or perhaps more than, on the quantity he brings to market. In the gutting, the salting of the fish, the packing, and the whole manipulation of the process of cure, the Dutch are governed, like all manufacturers, by the nature of their market, and the wishes of their customers. It is an article of delicacy which they have to supply at a delicacy-price; and they bestow upon the preparation the time and pains which are paid for in the price. The Dutch curer goes to the herring-fishing, across the North Sea, with a vessel which will not stow above 400 barrels. All his time and attention are directed to the perfection of this small stock. His barrels are new, and made of the best seasoned materials. His salt has gone through a process of purification. He packs up no fish that have not been carefully gutted before the sun, or rain, or wind, has injured their appearance of freshness; and he throws overboard those

that are not prime fish, unbroken even in scale. He finds his account in all this minute attention to the article he is manufacturing. His fish, as an article of luxury, sell at a price often from L. 2, 10s. to L. 8. Sterling per barrel, which repays him with a suitable profit for his outfit, and time, and pains, bestowed upon so small a quantity. The mania of our Fishery-Board, the mistaken principle of all its proceedings, has been to enforce, by regulations, restrictions, bounties, and superintendence of fishery affairs, the same mode of cure for British herrings, which the Dutch find suitable to their market, without considering that the British herrings are consumed by a totally different class of customers, and are debarred almost by nature from being in the same markets as those to which the Dutch have access by their rivers. The great consumers of British herrings are the poor of Ireland, and of some of our own manufacturing and agricultural districts; the Negroes in our West India colonies; and the poor in Russia, and places adjacent to some of the Baltic ports. It is a cheap article of food, and, where salt is taxed, an economical condiment, not an article of delicacy at a delicacy-price, that these customers want. They are our natural customers. The small quantity of stock which a vessel can carry to the fishing, necessarily limits the Dutch curer to preparing his few barrels as a delicacy, for the consumers who use them, and pay for them as a delicacy. The large quantities of fish brought on shore at once by our boat-fishing, when the body of fish is hemmed in by the land, and which no exertion can save from many hours' exposure to the weather, and to damage, point out those markets at which cured herrings are bought for food as our natural markets, not those at which herrings are only wanted as a delicacy, in which state, we cannot, with any advantage, present the article. The constant and unavailing struggle of the Fishery-Board has been, to force the trade into a channel not suited to it; to obtain a market which is not the natural market for the kind and quantity of the article produced by us. All the attempts of the Board to establish the deep-sea fishing, and the curing on board of vessels, in imitation of the Dutch, have failed most ridiculously;—ridiculously, because, notwithstanding the offer of tonnage-bounty to an amount that would almost, without fish, pay the expense of the vessel, not one vessel is to

be found in the deep-sea fishing ; not one curer is to be found to follow the recommendations, aided by the bounties of the Fishery-Board, to take the dearest of two ways of curing a cargo of herrings. The regulations, restrictions, and superintendence of the Fishery-Board, and its officers, have therefore necessarily been confined to the herrings cured on shore, and intended, and only fit for a cheap article of food, not for an article of luxury ; while all the regulations, restrictions, and superintendence, proceed upon the principle of curing a very different article for a totally different market. This erroneous system is, in fact, prejudicial to the British herring-fishery, which is loaded, by this inconsistency, with expenses incompatible with its proper object, the production of cheap food. The Board stimulates, by an extravagant bounty, the catching of the greatest quantity of herrings possible ; and adopts and enforces a code of regulations for the cure of herrings, which is applicable only to the smallest quantities at one time.

It is a little amusing, and not a little absurd, that the regulations for the apparently not very complicated business of curing a barrel of herrings, fill a pretty thick pamphlet for the curer's and the fisherman's study ; and that it is almost as difficult to cure a barrel of herrings as to brew a barrel of whisky, according to law. The principle is false upon which all this system of interference, and encouragement, and bounty, stands. As long as Government paid the curer a bounty, equal to one-fourth of the prime cost of his fish, the curer had no right to complain of any interference. If it was a little troublesome, it was well paid for by the bounty. Now, however, as the bounty is taken off, the curer may be allowed to inquire, if the manufacturer of salt-fish is not to be at liberty to follow his own judgment in the manufacture of his article, and to suit his goods to his customers, at his own risk, and to his own loss, if he does not suit them. He may be allowed to ask, why the pickling of herrings should be under the superintendence and control of a Board, and of officers, any more than the pickling of pork, or the making of cheese. Stilton cheese is an excellent thing, a delicacy, like Dutch herrings, selling at a delicacy price. Would it not be a ridiculous thing, if Government were to establish, by an act of Parliament, a Board of Commissioners for regulating

the making of cheese, with cheese officers, and cheese bounties, and cheese regulations, in order that all British cheese may be made equal, if possible, to Stilton cheese? Would not the dairy farmers say, that Stilton cheese is an excellent thing for those who can afford it; but there are labourers who can only afford to consume the very cheapest cheese that can be made, and every addition to the expense of making their kind of cheese is only diminishing the consumption, and narrowing their market? Cheese is an article consumed to as large an extent as salted herrings; and a Cheese Board would not be at all a more ridiculous interference on the part of Government, nor more opposed to every sound principle of trade, than is the Fishery-Board.

But, if there were no Fishery-Board, it may be said, no regulations, no restrictions, no superintendence of officers,—if every curer was allowed to cure his fish as he pleased,—there would be an endless train of frauds upon the public. Barrels would be made of insufficient staves,—the public would be defrauded in the size of the barrels,—fish not perhaps sound, or wholesome, would be put in the middle of the barrel, with a few good fish at each end to conceal them,—the pickle would be running out,—the fish would be half dry,—they would be imperfectly gutted, or perhaps not gutted at all;—the crown-brand, or mark of the fishery-officer, is a guarantee to the public that the barrels so branded or marked have been inspected by a fishery-officer, and are free from all or any of these defects, and may be safely purchased as barrels of well-cured fish. The plain answer to these objections against reducing this worse than useless establishment, with all its machinery, is, that it may be safely left to the self-interest of the manufacturer to prepare the best article, in curing fish, as in weaving cotton, to suit the market; and it may be safely left to the good sense of the buyers of herrings, as of calico, that they will not give the same price for a bad article that they will for a good one.

If a merchant buys flour, or tobacco, or indigo, and is not himself a baker, or tobacconist, or dyer, what does he do? He employs a broker skilled in these articles, and the broker, whose living depends upon his employment, takes care that his employer is not wronged in a single leaf of tobacco, or shade of indigo, or pound weight of flour. If the merchant, not being

a fish-curer, or cooper, himself, intends to buy a parcel of herrings, he would employ a herring broker, who would gauge the smallest looking barrels, as the fishery-officer does; would open every second or third barrel, as the fishery-officer does, to see that the fish are fairly packed, properly gutted, and well cured; would inspect to the bottom, as the fishery-officer does, every barrel he suspected to be ill cured, or packed; and would do all, in short, that the fishery-officer does, or can do, in his inspection of fish; and would put his mark, as the fishery-officer does, on the barrels which he recommends to his employer. The only difference would be, that the fish-broker would be paid, as he ought to be, by those who employ him, instead of being supported at the public expense. The country would get rid of a useless and expensive establishment, which counteracts the very object for which it was instituted, and is more suitable to the spirit and policy of the fifteenth century than of the nineteenth.

In Portugal, by way of encouraging the breeding of cattle, it is prohibited to kill calves, or sell veal in the markets; and the eating of eggs is declared to be highly detrimental to the increase of poultry. Our Fishery-Board has undoubtedly studied political economy in Portugal. By way of preventing the breed of herrings from being exhausted by our fishermen, it is enacted, sagely and seriously enacted, that the meshes of herring-nets shall be an inch in width, in order to allow the little young fish to get through, and to take only the full-grown fish. Will it be believed that the country is at the expense of keeping a ship of war to cruize about among the fishermen on the coast of Scotland, principally to enforce this regulation, and seize the unlawful nets? The full-grown herrings must take it very kind of the Fishery Board to show such affectionate regard for their offspring. In the Philosophical Transactions of 1767, it is stated that the number of eggs in a female herring is 36,960. The number of full-sized herrings in a barrel is about 600; and a fishing producing 100,000 barrels of herrings, just takes 60,000,000 of fish. Now, to reproduce this 60,000,000 of fishes, to replace this devastation in the species, will just require 1624 female herrings, such as were examined in forming the table in the Philosophical Transactions, 1767; and which we

may presume to have been average fish, with regard to the quantity of spawn. 1624 herrings are about the number contained in two barrels and seven-tenths of a barrel; consequently, if the Fishery Board could have ascertained that, after a fishing of 100,000 barrels of herrings, as many as $2\frac{1}{2}$ barrels of live herrings remained in the ocean, they might have slept with a tranquil conscience, without dreaming that a sloop-of-war was necessary to protect the genus *Clupea* from extermination by small-meshed nets.

This foolery about the size of the meshes of nets, seems not to have been extended to the coast of England. The fishing of sprats, by nets of a mesh suited to the size of the fish, is carried on to a great extent immediately previous to the herring-fishing, when the young herrings must be on the coast. In Scotland such nets would be unlawful, and condemned at any season. It is not the least of the objections to the Fishery Board's regulations, that what is law to one man is not law to another; what is prohibited to the Scotch fisherman, as destructive of the fry of herring, is permitted to the Norfolk fisherman, at the same season, for the taking of sprats. Unnecessary regulations are generally inconsistent.

In withdrawing the extravagant bounty of four shillings per barrel on the production of herrings, Government proceeded with great wisdom. The manifest error of the Fishery-Board, in granting so disproportionate a bounty, was not corrected by a sudden jerk: the bounty was gradually reduced, by a shilling each year; so that when it finally expired, no concussion was felt; and even among those who had an apparent interest in its continuance, there was but one opinion on the propriety of reducing it. The wise and steady proceeding of Government in this measure, in opposition, no doubt, to the official opinions, if they were asked, of those connected with the regulation of the fisheries, leads to the hope, that the whole system, as well as the money part of it, will be abolished;—that it will be as free to cultivate the sea, as it is to cultivate the land, according to every man's own judgment and experience;—as free to manufacture that simple article of food, salted fish, as it is to manufacture cheese or broad cloth. Consumption is the only true encouragement to production. Freedom of judgment in manufacturing

what will suit the consumer, is the only true encouragement to consumption. With these, boards, and bounties, and regulations, and restrictions, and superintendence, and officers, may be all dispensed with.

The increase of the *seafaring* population of these kingdoms, which it is the object of Government to promote by the system of fishery laws, must depend, like the increase of any other class of workmen, upon an increased demand for their labour. An increased demand for their labour, can be founded permanently only upon an increased consumption of the productions of that labour. Government may, by bounties, force production, but cannot force consumption ; and a demand for any particular sort of labour which ends in production alone, and not in a corresponding beneficial consumption, can only deteriorate, and not improve, the condition of that particular class of labourers. It is ultimately a discouragement, not an encouragement, to that kind of labour. It is doing nothing, worse than nothing, it is doing mischief, to facilitate and encourage, by bounties, a production beyond the natural consumption of the article produced. For the encouragement of the fisheries, Government can do nothing better than to leave the fisheries alone,—to leave the increase of that portion of the community who live by sea-labour, to the natural demand for that kind of labour from the rest of the community. But if Government will be doing, there is one way in which the increase of our *seafaring* population may be promoted, which is by improving the condition of that class of labourers, so as to make it a preferable one. This is not to be done by attempting to force a consumption for the production of their labour, which no Government can do ; and still less by promoting a production not called for by the consumption, which only counteracts the object in view ; but Government could diminish the cost of production to the *seafaring* labourer, and improve his condition, by lessening the expense of the materials of his trade. Wood, hemp, canvas, iron, are his materials ; and the duties on these articles add materially to the expense and discouragement of his condition and trade. If considerations of fiscal arrangement could admit of these articles being used free of duty by any fisherman, a much less sum of money would be lost to Government, and a much greater advantage conferred on that class of men, than by the extravagant bounty to fish-curers. A vessel of 85

or 40 tons, suitable to the fishing, cannot be put upon the sea under an expense of L. 300 Sterling. This sum is a little fortune in itself, such as few people in the class of fishermen can amass. A fishing boat for the herring-fishing, of 26 or 28 feet of keel, cannot be built and rigged under L. 50 Sterling ; and two drift of nets, fully mounted, will cost as much more. It is but an open boat, suited for going a few leagues from the shore only, which is provided for by this capital ; and the class of capitals among fishermen cannot be expected to exceed this sum. It is owing to this cost of material, that we have no population of fishermen living on board ship ; no class of vessels in the cod or herring fishery fit to keep the sea in all seasons. Whoever has seen the substantial class of vessels fitted out from the ports of the Netherlands and France for the North-Sea fishing, and has seen the old crazy sloops, the Scotch wood, clinker-built craft fitted out from our Scotch ports, must feel shame and regret at the inferiority of our outfit. The smacks fitted out from the Thames are, to be sure, exceptions ; but their trade of supplying the London markets with live fish, is, by the regulations of the Corporation of London, and the Fish Salesmen, a kind of monopoly in effect, and is not open practically to the fishermen of the country. The vessels fitted out from the English ports, south of the Tyne, are in general more substantial and valuable than those from the Scotch coast. The reason is, that the bounty system had not been extended to England long enough to produce the same bad effect that it produced in Scotland ; that of withdrawing the small capitals from the employment to which they were suited, of fitting out good substantial vessels for the fishing ; and of throwing them all, by the temptation of the bounty, into speculations of fish curing : so that the fisherman who had a little money was tempted out of his proper line, and became a fish-curer, and owner of a few empty barrels, instead of investing his capital in a substantial vessel for his own trade. A reduction of duty to the fisherman on the material employed in his vessel and nets, would no doubt improve his condition, and make it preferable to the condition of other labouring men,—which is the only way Government can promote the increase of that class. But the easiest, safest, and wisest encouragement which Government can grant to the British fisheries, is to let the British fisheries alone.

ON THE HISTORY OF TITHES.

To the Editor of the Quarterly Journal of Agriculture.

HAVING observed a notice in the last Number of your Journal, which announced your intention of advertizing to the subject of Tithes, I beg leave to transmit to you the following brief history of the origin of this tax.

In most of the recent discussions on the question of tithes, that branch of the subject which relates to their history, seems to have been very much overlooked. The laborious works of Selden, Prideaux, and others, in which this matter has been so ably treated, are not generally in the hands of the public; and even if they were, are perhaps too abstruse and intricate for the perusal of the popular reader. There seems, in consequence, to exist in the public mind a degree of doubt and uncertainty, both with regard to the origin and the nature of the right of tithes, to remove which ought, I think, to form a primary object of your proposed observations. The arguments to be drawn from these historical deductions chiefly relate to the right of Government to legislate on the subject of tithes; a right which is doubted by some, and denied in direct terms by others. Nay, the ministers of Government themselves do not seem to be altogether satisfied on the subject; for what other legitimate reason can be given for their having hesitated during so long a period, and notwithstanding the repeated applications of the people, to agree to a commutation of tithes, save that they entertain some doubt as to their right of doing so.

For many centuries, and in all the countries of Christendom, the tithe, or tenth part of the property of the people, has been set aside for the maintenance of the clergy. So far back, indeed, in the history of the Christian Church, did this practice originate, that many suppose it to be coeval with its institution, and to form one of the ordinances of its Divine Founder. Upon this idea, it has been argued that tithes are the property of the Christian clergy by divine right or appointment. The supposition, however, appears to be entirely erroneous; as no claim is made of tithes in the New Testament, and it is certain that during the early ages of the church none were exacted. The claim of the clergy, therefore, cannot validly be rested upon the

authority of any divine right. With regard to the existence of a civil right, however, the case is different. In many Christian nations such a right exists, and in England it is particularly strong; being not only originally vested by especial charter, but confirmed by many subsequent laws. Rested, therefore, as I conceive it to be, upon the authority of civil enactments, I do not mean to dispute the validity of the clergy's right to tithes, but to maintain that, as this right emanated originally from the legislative assembly of the people, so the same legislative assembly have it still in their power to alter, to modify, to restrict, or even altogether to abolish it, should circumstances demand one or other of these steps. At present, indeed, although circumstances strongly demand the former, they do not seem to demand the latter alternative; and though many are anxious to see the right of tithes put under proper restrictions, and the obnoxious parts of it removed, few wish to see the entire abolition of it. A brief sketch of the history of tithes will tend to explain both the nature of the right by which they are held, and the source whence that right originally emanated.

It is well known that the payment of tithes to the priesthood was enjoined by the laws of Moses; and this is the first notice that we find taken of them in history*. It were idle to inquire why that great lawgiver, in selecting a portion from the property of the people to be devoted to the payment of the priests, should have fixed upon the tenth part in preference to all others; and it is probable that his reasons were connected with relative circumstances, of the nature of which it is impossible for us, at this distance of time, to judge†. Many of the ceremonies under the Jewish ritual, and many of the moral and political ordinances of the law, had reference to such peculiar circumstances, not being designed to be binding beyond the age and country in which they were enacted; and the regulation regarding tithes seems to be one of these. At all events, whatever was the cause or object of this regulation, we must look upon it as having ceased to be in force, at the same time, and in the same manner, as the other parts of the Mosaic constitution. That

* Levit. c. 27, v. 30. Numbers, c. 18, v. 21. Deuter. c. 14, v. 22.

† We may refer those who wish to see this question fully discussed, to the learned and laborious inquiries of Prideaux and Selden.

it virtually did cease to be so, we learn from the history of the Christian church which immediately succeeded that of Judea. Had the Divine Founder of that church meant that this should form one of its laws, he would either have endeavoured to enforce it as a still existing part of the Mosaic, or have enjoined it anew as a constituent part of the Christian, constitution. Neither of these steps, however, was in fact taken. Throughout the whole history of the acts of our Lord and his apostles, we do not find that they ever attempted to claim, as their own peculiar portion, any particular part of the property of their followers *. On the contrary, they supported themselves entirely either by means of such free-will offerings as were bestowed upon them, or by the labour of their own hands; and so meagre at times were their supplies, that they were often obliged to augment them by the interposition of miraculous agency. Neither throughout the Gospels do we find any law by which the followers of the church are enjoined to pay tithes, or any passage whatever which can be construed as conferring a right upon the clergy to exact them. But, in the same disinterested and benign spirit which breathes over every maxim of these divine books, wherever the temporal affairs of the people are spoken of, it is with no command to bestow their goods upon the clergy, but with an injunction to remember the poor. The small sums of money which were collected by our Lord and his apostles from their proselytes were kept in a bag, which was carried by one of the disciples, and of which the larger part of the contents was employed in supplying the poor with alms.

After the Ascension, and during the ministry of the apostles, we find that the same system was pursued. No tithe or other particular sum was exacted, no claim to any such was made; but whatever free-will offerings were presented were gratefully received, and mostly distributed again in the shape of alms. If we trace the history still farther down, to the Christian church of Egypt, founded by St Mark, the disciple of St Peter, we find that the same rule was observed; and Philo-Judæus, an author of that time, informs us, that the Christians of Egypt, as well as of many other provinces, dwelt together in habitations called *monasteria*, where none was possessed of any private property, but

* Cruden's Concordance, v. Tithe.

where all lived in common upon the free-will gifts presented to them, devoting themselves entirely to prayer, to singing of psalms, to theological discussions, and to temperance. Sir Henry Spelman refers to a passage in Tertullian, from which we learn that the same was the usage of the Christian church in Rome, in Africa, and other places, at a still later period *. “Whatever we have in the coffers of our churches,” says he, “is not raised by taxation, as though we put men to ransom their religion; but every one who will, once a month, or when it pleases himself, bestows whatever he thinks fit, but not unless he listeth so to do; for no man is compelled, but left freely to his own discretion. That which is bestowed is considered as the pledge of piety (*depositum pietatis*), for it is not employed in banqueting, drinking, or gluttony, but in nourishing and burying the poor, and upon such children as are destitute both of parents and maintenance, upon aged and feeble persons, upon shipwrecked seamen, and those who are condemned to work in the mines, and upon those who, professing the true God and the Christian faith, are banished to the islands or cast into prison” †.

During the era of the great persecutions which shortly succeeded that of which Tertullian speaks, we are not accurately informed how the clergy were maintained. It appears, indeed, from a passage of Cyprian ‡, quoted by Sir Henry Spelman, that the oblations of the faithful were at that time collected in *Sportulæ* or baskets; but whether, during those days of clerical degradation, these were carried about from place to place by the priests themselves, as alms-baskets, or whether they were merely used as means of secrecy, where the offering might be deposited without exposing the offerer to the resentment of the persecutors, remains matter of doubt. One thing, however, is certain, that, during that period, no tithes were exacted. Indeed, so rigorous and bloody were these persecutions, that to be devoted to the church while they continued, was just another term for being devoted to martyrdom; and none, it may be supposed, enlisted

* Tertullian flourished about the end of the second century.

† Tertullian in Apol. cap. 39.—“Etiam si quid arcæ genus est,” &c.

‡ Cyprian ad Clerum, lib. 4, ep. 5, p. 126.—“Cæterum Presbyterii honorem designasse nos illis jam sciat, ut et sportulis illam cum Presbyteris honoratur, et divisiones mensuræ equalis quantitibus partiantur.”

under her banners, save those whose zeal and enthusiasm were such as led them to despise life and all temporal things, and to whom, to use their own language, the wealth of the world was as dust in the balance. Eusebius * informs us, that the clergy of those days aspired to martyrdom as to a most desirable consummation of their labours; that they inured their bodies to all the hardships of the seasons and of fasting, exposing themselves to the inclemencies of the weather, bare-footed and in thin clothing; that they spontaneously submitted to all the sacrifices which the austere rules could devise, eating only such quantity of coarse victuals as was necessary to sustain life, drinking nothing but water, abstaining from all indulgencies, denying every thing to every sense, and placing their sole delight in prayer and preaching. It may be supposed that a very wretched pittance was all these men required, and that the most meagre alms would suffice for their maintenance.

Such was the poverty, the abstinence, and humility of the ministers of the Christian church, during the continuance of these dreadful times, and until the Emperor Constantine, by the edict of 313, staid the arm of persecution. It is from this period that we are to date one of the greatest revolutions that has taken place in the church, both with regard to the temporalities which her ministers enjoyed, and the spirit with which they were inspired. The Emperor Constantine the Great, himself a zealous proselyte to the faith, heaped upon them all the favours and riches which he had it in his power to bestow; he endowed them with possessions, privileged them with immunities, and displayed towards them every act of the most liberal and devoted munificence. It is a trite observation, that the acquisition of power or wealth always engenders the desire of still greater aggrandizement. The clergy, while they were poor, needy, and persecuted, received with gratitude whatever the bounty of their followers bestowed: but now that they were raised to riches and honours, they looked upon these free-will gifts as poor and insufficient, and began to look about them for the means of enforcing greater liberality. They argued from Scripture, that their term of trial was past, and that they

* Eusebius Pamphilus, the Ecclesiastical historian and chronologer, composed his history immediately after the time of the great persecutions of the Christian church. He died about the year 340.

were now to receive an hundred-fold for all that they had suffered *. It was at this time that the right of the church to the tenth part of the laymen's property was first pleaded. The Alexandrian Father, Origen, indeed, had argued this right in several sermons and homilies, some years previously, but it was not till the age we speak of that the subject was warmly and generally entered upon. St Hilary, St Ambrose, and St Chrysostom †, were three of its principal agitators. Several of the homilies of these fathers, connected with it, are still extant; and the arguments which they contain are chiefly drawn from strained constructions of some passages in the New Testament, or from the propriety of the Christian people showing the same liberality towards their pastors that the Jews showed towards their priests. As a specimen of the rest we may quote the following words of St Chrysostom. "O how disgraceful it is, that what was reckoned no great thing among the Jews, should be said to be so among Christians! If it were dangerous not to give tithes then, it is surely much more dangerous now. I require no great matter, but only that, as the Jews, who were babes in religion, and covered with much iniquity, did freely pay, so let us pay who expect the kingdom of heaven. I make not this declaration, as if I would frame a law or forbid you to give more; I merely urge that not less than a tenth be consecrated. This must be done by all who gather in any just increase" ‡.

But the matter did not rest here. The arguments of the Fathers were soon followed by the canons of the Church, which, after this period, were passed in great numbers, enjoining the payment of tithes. The first of these §, was the sixth chapter

* The following passage from St Mark's Gospel is recorded as one of the texts by which the clergy of that day justified their pretensions to greater revenues:—"There is no man that hath left house, or brethren, or sisters, or father, or mother, or wife, or children, or lands, for my sake and the Gospel's, but he shall receive an hundred-fold *now in this time*, houses and brethren, and sisters, and mothers, and children, and lands, with persecutions: and in the world to come, eternal life;" c. 10, v. 29.

† St Hilary, St Ambrose, and St Chrysostom, flourished about the middle of the fourth century.

‡ Homil. 43. in 1 Corinth.

§ We do not take into account the canons attributed to the Apostles, as these are now generally allowed to be apocryphal. On this subject we refer the reader to Selden's *History of Tithes*, chap. 5.

of the Concilium Agrippinense, which declares tithes to be the "rents of God," (*Dei census*), and as such due to his ministers; but states, at the same time, that the clergy agree to take the fourth part only. The fourth part, however, namely, the fourth part of the tithe, is commanded to be paid on pain of excommunication. This council, which was held in the year 356, was followed about the year 375, by the Concilium Romanum, in which it is decreed, "that tithes and first fruits shall be given by the faithful, and that they who refuse to give them shall be smitten with the curse *." Innumerable other canons of the different councils, which we decline citing, all to the same purpose, and passed after this period, are quoted in the laborious works of Selden and Prideaux. Some of them are accompanied by the most dreadful denunciations against recusants.

Hitherto, it must be observed, no civil enactment had declared tithes to be the property of the clergy. The right to them, which the church established by means of these canons, was one entirely of its own creation, neither authorised nor ratified by any civil power in Christendom. Although, therefore, the fear of excommunication caused this right to be recognized by the lay followers of the church, it is evident, that whenever, by any change of circumstances, this fear should cease to operate, the right would cease to exist. No civil penalty being attached to recusants, but obedience being exacted solely by the fulmination of the ban of the church, it was only necessary that men should be brought to despise this much dreaded engine, in order to cause an immediate cessation of the payment of tithes. Such, however, was the well-known influence which, in the earlier ages of the church, the dread of excommunication exerted over the people, that it was alone found sufficient during the lapse of nearly four centuries, to enforce obedience to the canonical regulations on this subject.

It was about this time †, four hundred years after the sitting of the Concilium Agrippinense, at which, as has been stated, the first recorded canon of the church, relating to the payment of

* "Ut decimæ atque primitiæ à fidelibus darentur: qui detrectant anathemate feriuntur."

† The middle of the eighth century.

tithes, was passed, that Pepin, a zealous proselyte of the Christian faith, and the well-known ally of the Pope, ascended the throne of France. Amongst other acts of his munificence towards the church, to the support of which he devoted a great portion both of his power and his wealth, this prince, about the year 764, enacted a law, which declared tithes to be the property of the clergy, and ordained every layman, under severe penalties, to pay them to the bishop of his district, by whom they were to be dispensed *. This, as far as we have been able to learn, is the first civil enactment that was passed upon the subject, and by it, the right of the clergy to tithes, at least in France, was placed upon a new and more firm footing. What they had hitherto obtained from their lay followers, merely through the fear of threatened excommunication, was now declared by the legislative authority to be their own property; and the much-dreaded weapon of ecclesiastical warfare was united with the equally dreaded one of civil power. The political events which immediately succeeded the reign of Pepin, tended to spread his law regarding tithes, which was originally confined to France, over other kingdoms of Christendom. Charlemagne ascended the throne with a mind much more liberal and enlightened, but as fully devoted to the service of the church as his father. All the ecclesiastical privileges and immunities, and that of tithes among the rest, granted by the latter, were ratified and confirmed by the former, and continued to follow the spread of his rapidly increasing dominions, until they extended over a great part of Germany and Italy. In 789, after the conquest of Saxony, he passed a law ordering tithes to be paid in that country †; in 794 a law to the same effect for Germany was passed at Frankfort ‡; and the capitulars which he made for the Lombards in 801, contain a similar ordinance for Italy. And although the empire of Charlemagne did not include Spain, Prideaux informs us that laws enforcing the payment of tithes were promulgated about

* "Sic prævidere faciatis et ordinare de verbo nostro, ut unusquisque homo, aut vellet aut nollet, Decimam donet, atque per jussionem Pontificis (Episcopi) sui dispensetur."—Baluz capit. tom. i. p. 197.

† Baluz capit. tom. i. p. 246.

‡ Ibid. p. 207.

the same period in that country *; and thus we may conclude, that in the beginning of the ninth century, tithes were exacted by the clergy all over the Christian part of Europe, not merely by the influence of their own canons, but by the authority of civil enactments. These enactments have since been renewed or confirmed from time to time; and, under certain modifications, the rules which they contain continue more or less to regulate the payment of tithes at the present day.

I have considered it necessary to enter into this rapid detail of the origin and constitution of the civil right of tithes on the continent of Europe, in order that the brief remarks which are to follow, regarding their history in our own country, may be more fully understood. Indeed, in those early ages, although England was politically an independent power, yet, when considered in an ecclesiastical point of view, she formed but one of the many provinces of the great mother church; to all of which the main leading points of the history of Christianity are equally applicable.

It is not very much to our purpose to ascertain the precise era when Christianity was first introduced into Britain. It is asserted by some that this took place under the ministry of St Paul himself, so early as the middle of the first century; but whether this be correct or not, it is certain that its progress was very inconsiderable, till Augustin was sent from Rome, for the express purpose of promulgating its tenets among our Saxon ancestors. Augustin, accompanied by forty monks, arrived in Kent in the year 597, at which time Ethelbert filled the throne of that province, and immediately commenced a course of zealous theological instruction, in consequence of which Christianity made very rapid progress, not only in Kent, but in the adjoining kingdoms. Our early chronicles inform us, that both before and after the arrival of Augustin, the clergy were maintained, as we have already stated they were in the Christian nations abroad, entirely by the free-will offerings of the people, which were brought to them once a-week or once a-month, as opportunity offered. It must be observed, that, at the time of Augustin, the doctrine of tithes was no novelty, upwards of

* Prideaux, *Original and Right of Tithes*, p. 159.

two centuries having elapsed since the passing of the first Roman canon regarding them ; but whether it was, that Christianity was not then considered sufficiently established, or to whatever other cause it was owing, no claim seems to have been made to them in England, either by him, or his immediate successors. It is said, indeed, that he argued in his public discourses, that as tithes had been paid by the Jews, so his hearers, who were much more blessed under the Christian dispensation, should take care that their offerings amounted to a tenth part at least ; but no evidence appears of his having demanded this part as the due or right of the church. We need not doubt, that, at that time, there were many upon whose minds, heated by zeal for a new religion, this argument may have produced the desired effect, and that, in consequence of it, many of the offerings presented not only equalled, but exceeded, the tithe of the property of the offerer ; but we can never for a moment suppose, as some writers on the subject do, that this feeling was universal, or that it influenced not only the poor laymen, but even the proud and avaricious barons of England, to such a degree, as to cause them to confer upon the clergy full and perpetual grants of the tithes of their extensive manors. Some have even gone so far, lately, as to argue the inviolable nature of the right of tithes upon this ground ; and to assume that, as the clergy hold them, without exception, all over England, in virtue of such grants made by individual landed proprietors, during the sixth and succeeding centuries, so the legislature of the present day have no more title to interfere with them, than with any other species of private property. Such an argument, even were it well-founded, has an extremely dangerous tendency ; and it is well, therefore, that, in the whole range of the chronicles and records, no proof can be found in support of it. One or two charters, indeed, there are, in which we find such grants ; but even allowing the authenticity of these, still the amount of the tithes to which they convey a right, does not reach to a thousandth part of the amount of the tithes of all England ; nor ought any to argue from such isolated and uncertain relics, that this practice, which might have been adopted by a few zealots, in favour of the churches of their own institution, was universal over the

whole kingdom. In all inquiries of a historical nature, such as this, where the records fail, and conflicting statements perplex us, there still remains one sure and invariable principle to guide our researches ;—the principle of human nature. We are well aware how great an influence zeal for religion, especially a new religion, has over the minds of men, and we may believe, that the eloquent discourses of Augustin and his followers might have inspired some of their hearers to such a degree, as to lead them to overlook their own self-interest, and to confer upon their gifted teachers such perpetual grants of tithes ; but can any one bring himself to imagine, that this spirit was breathed over all, and that the powerful, independent, and too often lawless and profane chiefs of our ancestors, were alike, for ages together, affected by it ? It will be easy, indeed, to show, that the civil right of tithes in England, had its origin in that source from which alone it could derive the duration and stability which it possesses,—the legislature of the nation.

We find that in England, as well as abroad, tithes were first exacted in virtue of the canons of the church, armed with the threat of excommunication against recusants. As, however, the Christian faith was much later of being firmly established in this country, so the earliest of these canons bear a much later date than those of the continental nations. The most ancient which we find on record is one of Egbert, Archbishop of York, which is given in the *Concilia Britannica*, and noted there as being passed about the year 750. In this canon, the clergy are ordered to instruct the people how to pay tithes, and the people are ordained to pay them regularly on pain of the curse. The clergy are also instructed how to dispose of the tithes which they receive, by selecting one part for the improving and embellishing of their churches, another for the behoof of the poor and the stranger, and a third for their own maintenance *. This canon was followed, about the year 787, by another passed at Calcuth, which is curious, as showing that the clergy of that time rested their claim to tithes entirely upon the ordinances of the Mosaic constitution. It sets out with stating that tithes must be paid, as it is written in *the law* ; and after having

* *Exceptiones Egberti Archiep. Ebor. can. 4. Concil. Britan. p. 250.*

quoted a variety of passages from the Old Testament, to show that it is so written, it concludes as follows: "For these reasons, therefore, let every man pay the tithe of all that he possesses, for it is the special property of the Lord his God; and let him live and give alms from the other nine parts; and we exhort him the rather to do the latter in secret, for it is written, 'When thou dost an alms, let not a trumpet be sounded before thee' *."

These are the only two canons relating to tithes which I can find in the records; but they are sufficient for my present purpose, which is merely to show, that in England, as well as abroad, canonical regulations on this subject existed before any civil statute relating to it was enacted; a circumstance which is of itself sufficient to explain the fact, that even the earliest of these statutes speak of tithes, not as a new exaction to which the people were strangers, but as one with which they were previously well acquainted.

A peculiar circumstance, it is said, caused these canonical regulations of England to be followed much more rapidly by civil enactments than those of the other nations of Europe had been. Offa, King of the Mercians, the contemporary of Charlemagne, had invited Ethelbert, King of East Anglia, to his court, on pretext of giving him his daughter in marriage, and during his stay treacherously caused him to be put to death. It was to expiate this offence, if we may believe the historian Bromton, that in the year 793 he passed a law, conferring the tithes of all his kingdom upon the church, and ordaining his subjects to pay them regularly under severe penalties †. This law, which may be found in the *Concilia Britannica*, was made in the form of a grant or gift; and although it necessarily extended no farther than the kingdom of Mercia, it was full and absolute. It will be observed that the date of this enactment is a very few years subsequent to the enactments of Charlemagne on the same subject; and it is supposed by several historians that it was the advice of this prince, who declared that this was the most accep-

* *Concil. Calchuthense Legatum.* Can. 17. *Conc. Brit.* p. 298.

† Offa, Rex Merciorum nominatissimus, Decimam omnium rerum suarum Ecclesiæ concedit, anno 793.—*Conc. Brit.* p. 308.

table atonement that he could make to the church for his offence, which induced Offa to pass it. It does not appear, however, that the example of Offa was followed by any of the other princes of the heptarchy; and no farther enactment regarding tithes is on record till the time of Ethelwolf, who united in his own person the sovereignty of all the seven kingdoms. Ethelwolf made two separate grants or endowments of the tithes of his kingdom; but as the authenticity of the first of these, which was passed at Wilton in the year 854, is questioned, we shall not take it into account. The second was passed in the year 855, after the return of Ethelwolf from his pilgrimage to Rome, in a full parliament of the whole kingdom, held for the purpose at Winchester. This grant, which is in the form of a regular charter, confers on the clergy a full and unalienable gift of the tithes of all England, to be held by them in their own right for ever. It is formally attested by the peers of the land and the church dignitaries; and being duly signed and sealed, was offered in the most solemn manner by the king himself on the altar of St Peter, where it was received by the bishops in the name of God. As this charter forms the most ancient foundation of the civil right of the tithes in England, I shall present it at full length in a note; and surely the very existence of such a document is of itself sufficient to subvert the idea before alluded to, that the right of tithes has not its origin in any civil grant or enactment, but in the private endowments of individuals. Had such endowments in reality been made, the clergy would neither have urged Ethelwolf to pass this grant, nor would the barons have sanctioned a gift on his part of what they themselves had already bestowed*.

* The following version of Ethelwolf's charter is in the words of Ingulph, the most ancient of the historians by whom it is recorded. The second paragraph, however, is according to Mathew of Westminster, the language of Ingulph in this part being rather obscure. We have only to remark that the charter is also recorded by William of Malmesbury; and the slight differences of these three historians consist merely in phraseology, the sense of all being exactly the same.

1. *Regnante Domino nostro in perpetuum. Dum in nostris temporibus bellorum incendia, et direptiones opum nostrarum, necnon et vastantium crudelissimas Hostium depredationes, barbararum, Paganarumque nationum; mul-*

1. *Our Lord reigns for ever. Whereas in our times, from the raging of wars, the plundering of our riches, and the most cruel devastations of our powerful enemies, barbarous and pagan people; many tribulations meant to punish us*

After the death of Ethelwolf, we find that a variety of laws were enacted, enforcing the payment of tithes under severe penalties, by almost each successive king, till the time of Edward the Confessor, none of the laws enacted during whose reign are now extant; their loss in all probability being attributable to the panic and confusion occasioned by the Norman invasion.

It is well known to every reader of English history, that William the Conqueror, on his accession to the throne of England, framed a body of Norman and Norwegian laws, to which

tiplices tribulationes ad affligendum nos pro peccatis nostris, uaque ad interuicemem, tempora cernimus incumbere periculosos.

2. Quamobrem, Ego Ethelwulfus, Rex occidentaliū Saxonum, cum consilio Episcoporum ac Principum meorum, consilium salubre, atque uniforme remedium affirmavi, ut aliquam portionem Terræ meæ Deo, et Beatæ Mariæ, et omnibus sanctis, jure perpetuo possidendam concedam, Decimam scilicet partem Terræ meæ, ut sit tuta muneribus, ac libera ab omnibus seruitutibus secularibus, necnon regalibus tributis, majoribus et minoribus, siue taxationibus, quas nos Winteredden appellamus, atq; omnium rerum libera, pro remissione animarum, et peccatorum meorum, ad seruiendum soli Deo, sine expeditione, et pontis constructione, et artis munitione, ut eo diligentius pro nobis preces ad Deum sine cessatione fundant, quo eorum seruitutem in aliquo levigamus.

3. Acta sunt hæc apud Wintoniam in Ecclesia Sti Petri anno Dominicæ Incarnationis 855, Indictione tertia, Nonas Novembris, ante majus altare, pro honore gloriose Virginis et Dei Genetricis, Mariæ, Stiq; Michaelis Archangeli, et Beati Petri Apostolorum principis, necnon et beati patris nostri Gregorii Pape.

4. Presentibus et subscribentibus Archiepiscopus, et Episcopus Angliæ universis, necnon Beorredo Rege Mercie, et Edmundo East-Anglorum Rege, abbatum et abbatissarum, ducum, comitum, procerumque, totius terræ, aliorumque fidelium infinita multitudine, qui omnes regium chirographum laudaverunt, dignitates vero sua nomina subscripserunt.

5. Rex vero Ethelwulfus pro firmitate ampliore obtulit hanc chartulam scriptam super altare Sti Petri Apostoli; et episcopi pro fide Dei illam acceperunt, et per omnes ecclesias postea transierunt in suis parochiis publicandam.

for our sins, even to our destruction; we foresee times of danger impending over us.

2. Wherefore, I Ethelwolf, King of the West Saxons, with the advice of my bishops, and the chief men of my kingdom, have resolved upon a wholesome counsel, and uniform remedy, namely, that I grant some portion of my kingdom to God, and the Blessed Mary, and all the Saints, to be possessed by them in perpetual right, that is to say, the tenth part of my kingdom, which tenth part shall be privileged from all duties, and free from all secular services and all royal tributes, greater and less, and from the taxes which we call Winteredden, and that it shall be free from all things, for the remission of souls, and the forgiveness of my sins, to be subservient to the only God, without expedition money, or money for the construction of bridges, or the fortification of castles, in order that they may the more diligently pour forth prayers to God for us without ceasing, by which we do in some sort receive their service.

3. These things were enacted at Winchester, in the Church of St Peter, in the year of our Lord's incarnation 855, in the third indiction, on the Nones of November, before the principal altar, for the honour of the glorious Virgin and mother of God, Mary, and of the holy Archangel Michael, and of the blessed Peter, chief of the Apostles, and also of our blessed father, Gregory the Pope.

4. There were present and subscribing all the archbishops and bishops of England, together with Beorred, King of Mercia, and Edmund, King of East Anglia; and also a great number of abbots and abbesses, and dukes, and earls, and nobles of the whole kingdom, and an infinite multitude of others of the faithful, all of whom lauded this royal grant, and the dignitaries among them subscribed their names to it.

5. King Ethelwolf, for the more ample security, offered this written charter on the altar of the Apostle Peter, and the bishops received it in the name of God, and sent it to all the churches, to be published in every parish.

he was naturally partial, and by which he intended to govern his new dominions. The general dissatisfaction, however, which the people displayed on the promulgation of this code, induced the politic prince to withdraw it, and to adopt in its stead a full digest of all the existing Saxon and Danish laws by which England had hitherto been governed. To this collection, which was framed with great care, he gave the name of the laws of St Edward *, and bound himself by a solemn oath † to observe it inviolably in the government of the kingdom. In this famous collection, which forms the ground-work of the English common law, the right of tithes is amply provided for; indeed it contains the essence of King Ethelwolf's charter, and the spirit of the laws of all his successors on this subject ‡.

It is conceived, that even putting the charter of Ethelwolf al-

* This title was given to these laws, because they were the same by which the Confessor had governed. The words of the rubric are—"Leges Sancti Edwardi quas in Anglia tenuit,"—the laws of St Edward which he observed (not which he framed) in England. William of Malmesbury tells us, that the name of St Edward was given to them,—"*non quod ille statuerit, sed quod observaverit*,"—not because they were *enacted*, but because they were *observed* by that prince.

† Mathew of Paris, p. 1001.

‡ As it has been asserted by some, who have not certainly studied these laws very minutely, that they make no provision for tithes, I lay before the reader a single extract from them, which I take from the *Concilia Britannica*, p. 620.

§ 8. De omni annona decima garba Deo debita est, et ideo reddenda. Et si quis gregem equarum habuerit pullum reddat decimum, qui unam tantum vel duas habuerit, de singulis pulis singulos denarios. Similiter qui vaccas plures habuerit decimum vitulum, qui unam vel duas de vitulis singulis obolos singulos. Et qui casum fecerit, det Deo decimum, si vero non fecerit, lac decimo die. Similiter agnum decimum, vellus decimum, butyrum decimum, porcellum decimum.

§ 9. De apibus vero similiter, decima commodi, quin etiam de bosco, de prato, de aquis et molendinis, parchis, vivariis, piscariis, virgulis, hortis, et negotiationibus, et omnibus rebus quas dederit Dominus, decima pars ei reddenda est, qui novem partes simul cum decima largitur.

§ 8. Of all corns the tenth sheaf is due to God; therefore let it be rendered. And whoever has a herd of mares shall render the tenth colt; and if he have only one mare, or two, he shall pay for each colt one penny. In like manner, whoever has several kine shall render the tenth calf, and if he have only one or two, he shall pay for each calf one halfpenny. And whoever makes cheese shall give the tenth cheese to God; and if he do not make cheese, he shall give the tenth day's milk. In like manner every one shall give the tenth lamb, the tenth fleece, the tenth part of the butter, and the tenth pig.

§ 9. In like manner of bees, the tenth part of the increase; also of woods, of meadows, of waters, of mills, of parks, of ponds, of fisheries, of orchards, of gardens, of the profits of trade, and of every thing which the Lord has given, the tenth part shall be restored unto him, by whom the nine parts, as well as the tenth, have been bountifully bestowed.

together out of the question, the provisions made in the laws of St Edward form an ample basis on which the clergy may safely rest the validity of their civil right to tithes. This code, which has been justly termed the First Magna Charta, was held so sacred by our ancestors, that they caused their kings, before they were crowned, to swear to the observance of the privileges and immunities which it contains, and particularly the privileges and immunities which it grants to the clergy. The oath by which this was sworn has been handed down, sanctioned by custom, from age to age, and forms, nearly in the original words, a clause in the coronation oath at present in use. Each of our kings, on his accession to the throne, solemnly swears this oath, and binds and obliges himself "to observe the laws and customs granted to the people by the Kings of England, his lawful and religious predecessors, and particularly the laws, customs, and franchises granted to the clergy by the glorious St Edward, his predecessor *." With the alterations and amendments which circumstances have from time to time rendered necessary, the provisions contained in the laws of St Edward continue to regulate the law of tithes down to the present time.

From this brief sketch, then, of the history of tithes, it will appear, that though the payment of them was ordered by the laws of Moses, yet as they were never either exacted or claimed by our Saviour or his Apostles, the clergy of the Christian church cannot rest their right to them upon any divine authority. In most of the nations of Christendom, however, there

* The following are the words of this part of the Coronation Oath, as it is now administered :

Archbishop.—"Sir, Will you grant and keep, and by your oath confirm, to the people of England, the laws and customs to them granted by the Kings of England, your lawful and religious predecessors ; and, namely, the laws, customs, and franchises granted to the clergy by the glorious King St Edward, your predecessor, according to the laws of God, the true profession of the gospel established in this kingdom, and agreeing to the prerogative of the kings thereof, and the ancient customs of the realm ?"

King.—"I grant and promise to keep them."

The words of the original oath, as given in the Book of Oaths, and Rymer's Acta Publica, are as follows :

"Et nomement les Leys, et les custumes, et les franchisez grantez au clergy et au people par le glorious Roy Seint Edward."

exist, or have existed, laws in virtue of which the clergy are entitled to exact tithes. In England, this civil right seems to be particularly well secured. A regular charter, as we have seen, has been granted, under the hand of the King and his nobles, conveying to the clergy a full and perpetual gift of tithes. This charter has been farther enforced by the laws of the different posterior monarchs of the Saxon dynasty; and the whole have been recognized and confirmed by King William the Conqueror, in the body of laws which he collected under the title of the Laws of St Edward; to observe the privileges contained in which is solemnly sworn by each of our kings at the present time.

But the main conclusion to be drawn from the preceding statements is, that this civil right of tithes emanated originally and alone from the ancient legislature of the nation. This point being established, the title of the existing legislature to alter, to modify, or to annul this right, whenever circumstances or the general welfare of the country demand such a measure, cannot be denied. And if it can be shown that the existing state of the tithing system of England is such as to call for the exercise of this legislative power, surely Government cannot, without injustice, refuse obedience to the summons.

J. P. T.

[The conclusion arrived at by our learned friend, must, we think, be assented to by all reasonable men. Not only does the power exist in the legislative authority to regulate the civil possessions of the clergy, as of any other class of public functionaries, but the time is arrived when Government can no longer defer this necessary duty without opposing the just demands of the country. The tithing system of England and Ireland has too long withstood the force of public opinion; and the warmest advocates of the church establishment should desire that so obnoxious a mode of providing for its members should give place to one more in unison with the general wishes and the public interests. This branch of the subject, our readers will perceive, is treated of in detail in another part of the present Number.—
EDIT.]

ON THE DISEASE OF THE HORSE, TERMED NAVICULAR. *By*
Mr WILLIAM DICK, Veterinary Surgeon, Edinburgh. In
a Letter to the Editor.

SIR,

IN some of the preceding Numbers of your Journal, I have had occasion to treat of a few of the numerous diseases to which the foot of the horse is liable, and amongst others, that of contraction, navicular lameness, or grogginess. In your last Number I observe a letter by Mr Charles Clark of London, in which, I perceive, he is opposed to my views of the nature of that disease. I am glad to see such a gentleman as Mr Clark, who is already so well known as a writer on this particular subject in the *Lancet*, and *Farrier and Naturalist*, now come forward with so much zeal. Mr Clark is already too much wedded, I fear, to the side of the question which he has so long and eagerly advocated, to allow me to hope to be able to make a convert of him. But I will use my best endeavour to do so; and whether I succeed or not with Mr Clark, I shall at least have the satisfaction of affording the numerous readers of your Journal an opportunity of judging for themselves of the merits of our respective views upon the subject. I have very little doubt indeed with respect to the result; and, in the mean time, I feel much gratified by the opportunity which you have so kindly afforded me of making a reply to the observations which Mr Clark has hazarded upon this subject.

I must confess I am not surprized that Mr Clark should have opposed me in the views which I entertain regarding the nature of this disease. For if a person has, after considerable labour and study, arrived at what he thinks a fair and fortunate conclusion, and by which he not only expects to remedy or prevent the evil he has been combating, but by which he also hopes to establish his fame, should another happen to take such a view of the matter as completely to overturn his high expectations, it is natural to infer that he will endeavour to regain his ground. Such is the case with Mr Charles Clark;—

he, or rather his uncle Mr Bracy Clark, has been led to conclude that the whole of the evils which occur to the foot, arise from the confinement produced by the fixed nature of the common shoe. I have thought otherwise, and I am now prepared to establish my position; and in doing so I shall follow the arrangement which Mr Clark has adopted, though perhaps not the happiest one that might have been pursued.

From the manner in which Mr Clark, at the commencement of his letter, has introduced the term *Navicular disease*, one is almost led to imagine that he supposes I had invented the term. But he knew well that that term has been long in common use; and because it was so, I used it. The same remark applies to *Grogginess*, upon which he has also chosen to make some observations, stating by the way, that this "disgraceful grogginess" is a term which scientific men should be ashamed to employ, because it "bespeaks ignorance of its real causes." Now, Mr Clark should bear in mind, that common terms are best understood by non-scientific men, and for the information of these principally my essays were written; and Mr Clark himself says in the *Farrier*, we must use this term to be understood. Indeed, I have not the slightest fear that any one, unless under the influence of *grog* himself, will be in danger of mistaking this disease on account of the name. But I am more ambitious that the disease should be rightly understood, which Mr Clark himself considers to be a matter of some consequence, than to cavil about the name. I should have passed over this part of the discussion more slightly, had not Mr Clark recurred to these terms more than once in the course of his paper. At length, however, he gets so much enraged about this "disgraceful grogginess," and high sounding title of *navicular disease*, that he must inform your readers, from whence he supposed the term *navicular* to have been transferred. He finds fault with the teachers of the Veterinary College for having changed the term *Shuttle-bone* to that of *Navicular*.

I apprehend, however, that the change of the name of the bone was justifiable, because there being a bone fewer in the tarsus of the horse than in that of the human body, if the same names were to be applied at all, one must be left out; and as the bone corresponding to the *navicular*, in its relative situation,

has not, in the horse, a strict resemblance, but assumes more of the cuneiform character, I conceive it to be a cavilling about nothing, to find fault with its being transposed, as the *shuttle-bone* has as great a resemblance to a boat as a shuttle. It therefore appears to me, that whoever transposed the name has applied the term navicular because of the likeness of the bone to a boat; not its distance from the ground, as Mr. Clark sarcastically enough observes, and would have it to be supposed.

But not only would I defend those who have adopted the term *os naviculare* from blame, in as far as regards the bone itself; but I even contend for the correctness of the term, as conveying some idea of the disease. The symptoms which are exhibited by an animal affected with it are such as to convey some idea of a person just arrived from on board-ship, who, from the motion of the ship, has acquired a staggering gait. It is true, indeed, that these arise from very different causes; in the one the head is affected, in the other the feet: but it is the symptoms of which we are at present speaking. And as to Grogginess, the same remarks are applicable; the name is derived from the symptoms exhibited; and the veriest booby would not, from the name, mistake the cause. But then it is a term, says Mr. Clark, "which scientific men should be ashamed to employ," because it "bespeaks ignorance of its real nature." It would look more learned and scientific perhaps, to write *μεθυσμα*; the vulgar would not understand it, and then such an advantage it would be to the Grecians!

Mr. Clark next finds fault with my presuming to write upon a subject which has been so often discussed, and yet confessedly obscure, unless I had some new light to throw on the subject, instead of the observations I have made upon the views and treatment of others; and because, he says, these observations and opinions are not founded upon my "own practical knowledge" and "real experience." These are rather bold assertions. If the views and observations I have made are not my own, will Mr. Clark have the goodness to say where they are to be found. If the nature, progress, and effects of the disease described here have appeared in print before I wrote them in your *Journal*, I must confess I am curious to see them. But it must be allowed, that

they at least have appeared somewhat new to Mr Clark, since they have produced from him such a lengthened reply. With regard to my own practical knowledge and real experience, I am at a loss to know what that amount is which Mr Clark conceives necessary to enable a person to write on a subject. Trained from my youth to all the minutiae of the forge, in a practice tolerably extensive, and with the "real experience" of nearly a score of years—such, I humbly conceive, should have been a sufficient reason for preventing any one from honestly bringing against me the charge of a want of real experience; and if he means experience in the jointed shoe, I beg to state, that few, except himself and his particular friends, have given it a fairer trial than I have done.

When I wrote the essays for your Journal on the disease in question, I thought that the various states of the diseased synovial bursa had been stated with sufficient plainness to be observed without much searching, though Mr Clark asserts otherwise. But if he will again resume his search, he will find it stated, that the disease in the part under discussion was described as being liable to inflammation in the slightest degree, onward to the most destructive effect that takes place. By-the-by, the term "good or bad shoeing," as Mr Clark chooses to be hypercritical, is not mine. It is a common, and I think, an appropriate manner of expression in use, both in regard to the principles and practice of shoeing.

There are two essential points upon which Mr Clark and I are at issue, upon the establishment of which the hypothesis I have advanced must stand or fall; *first*, he does not believe that the navicular disease exists in more than one-fourth of the cases to which I allude; and, in the *second* place, he has yet to learn that it cannot be prevented by any mode of shoeing.

First, then, I assert, and he denies, the existence of the disease to the extent I have stated: well, we must have proof. Mr Clark brings forward what he considered a formidable array; he says, he has "examined thousands of *contracted* feet," and the result has been, that, in a very large majority, no morbid appearance whatever exists in *that* joint; though in some instances of chronic lameness in its worst stages, occasional well-marked cases are seen. These, continues he, form but a very

small part indeed of the number that are dead lame ; but he also acknowledges, that the disease may exist with little external contraction. He then repeats Turner's view of the causes by which it may be produced in such cases, without noticing, however, the remarks I have already made on such causes in the papers under discussion, and therefore I need not recur to them.

Now, I do not think that I have examined, by dissection, thousands of diseased feet ; but I have from necessity had occasion to examine, in the course of my lectures, a larger proportion of feet than many in the profession ; and I must say, that my experience has brought me to a very different conclusion to what Mr Clark has arrived at. In my former essays, I have given my ideas of the progress of the disease described, with the symptoms by which it is known ; and from the notions I have formed regarding it, I have been able to discover it in cases where my opinion has been put to the test by the immediate death of the animal, of which I could give many examples. But I shall only give an extract from a letter which I have just received from Mr Tennant, veterinary surgeon, Ravenstruther, near Lanark. He says, " you will, perhaps, recollect a horse belonging to Sir Richard Honeyman, Bart., that was sent for your advice, with lameness in both fore-feet, and with an enlargement on the pastern bone of the off foot ; this you considered as ring-bone with navicular disease, and recommended to fire the off one all round, and blister both repeatedly ; which was accordingly done, and the horse got almost sound. But it was unfortunately killed by a wound in the thigh from a harrow-tooth. I examined the feet, and found traces of considerable disease in both navicular bursa."

I have already stated, in my former essays, the symptoms by which the disease is to be discovered in the living horse, but as Mr Clark is still doubtful of its existence, and has challenged those who consider the navicular disease as the prevailing evil, I cheerfully accept his challenge ; and so confident am I of being able to point out the disease, that I will stake my reputation upon a single case. And I shall stand to the proof whenever Mr Clark chooses, by having the animal destroyed and dissected ; and let he who is wrong bear all expenses. And lest the distance between us should be any bar, I will undertake to

select a horse in which both feet are diseased; I will send him one to dissect himself and keep the other in reserve, as proof here.

But I must observe, that, in examining a foot, there is a care and a method necessary in order to see the disease properly. The *hoof*, or at least a great part of it, *must be taken off*, and the sensible frog removed; an incision must be made on each side of the tendon parallel with it, and at the extremities of the navicular bone, and the tendon afterwards dissected carefully down, separating it from the perforatus, when, on dividing the broad ligament which connects the tendon and the bone together, the synovial capsule is exposed; and, by laying back the tendon upon the sole of the coffin-bone, if any disease exists it will at once be seen. It may appear as an increased secretion of synovia, with inflammation of the synovial membrane, or this membrane may be abraded; perhaps a deposition of lymph, in a layer like a new membrane, may be found; or an abraded appearance of the tendon; or adhesion of it by a new membrane to the bone; a destruction or deficiency of the cartilage covering the bone; a roughness from ossific spicula upon it; an ulceration of the bone, or even pus, may be found in the bursa. Now, has Mr Clark proceeded in the manner I have described in the dissections he has made, or did he not rather only make a perpendicular section of the feet he examined? If he did so, I am not surprised that he has seen the disease in only one-fourth of the cases he dissected. I suggest this, because the examination of thousands of feet, if properly done, would require no little time; and because his uncle, Mr Bracy Clark, informed me, when I had the pleasure of seeing him in Edinburgh, that this was the manner he was in the habit of following. Now, if I am correct in the supposition that Mr Clark has examined the feet in this manner, I am only surprised that he has found so many examples, as the disease, by such means, can only be seen in the very worst cases.

But mark how the cases were selected. Mr Clark says, "I have examined thousands of contracted feet at the slaughter-houses in this metropolis, and employed the men to preserve for me all that they found in a diseased state at that *part*, and the result is, that, in a very large majority of *contracted feet*, no

morbid appearance whatever exists in that joint." I must here observe, however, that the men were very incompetent judges of the existence of those cases in which the disease was to be found. Such men would of course give Mr Clark plenty of contracted feet, so long as they got any thing for their trouble, and that, too, whether the horses were lame in the feet or not. But Mr Clark must recollect, that I have stated that it is only in contracted feet, *accompanied with lameness*, that the disease is likely to be found. I would have greater expectation of finding the disease in strong "coarse" feet of a certain character, without contraction, than in cases of contracted feet, where there was no lameness.

Mr Clark appears to have been content with nothing short of adhesion of the tendon, or ulceration of the bone; but surely he must have reflected upon the various stages and degrees of disease which must have existed from the commencement of that which has produced such effects. Might not the inflammation at the commencement be so acute as to render the animal *dead lame*? Might not that be allayed and re-excited? Would there not be various changes going on in the part, before the full and complete appearance which Mr Clark seems to have expected to find in every case, could have occurred? And might he not, in the examination of thousands of cases, have been disappointed in the appearances he expected, and the disease still exist in its most painful, though not completely developed stage? I will not insult Mr Clark by doubting his reply.

Mr Clark appears to have but very imperfect notions of my views of lameness, if he supposes that I confound diseases of the coffin-joint, and other parts, with that of the navicular bursa. I am of opinion that a scientific man ought to be able to detect and distinguish these diseases from each other; and I know that this can be done.

I am unwilling to suppose Mr Clark has mistaken me, or that he wishes wilfully to mislead, by quoting the older farriers on coffin-joint lameness; but I am compelled to say, that he has not clearly stated what he means, when he speaks of the coffin-joint being affected. Nay, if it had not been that, in the commencement of his letter, he had found, by searching my essay,

that "this magnified evil" appeared to consist either in an ulceration of the small transverse or shuttle-bone of the foot, or in an adhesion between it and the perforans tendon, which passes under, and is attached immediately below it, I would have been compelled to have charged him with a total ignorance of the anatomy of the foot, or at least with a want of the knowledge of the seat of the disease; because we find him stating, p. 564, "that it may happen that the *terminating articulation of the foot, formed by the coronet, coffin, and shuttle-bones*, may become highly inflamed;" and, at p. 566, that "*the coffin-joint lameness* (is) a term fully as correct, and much more distinctive, than that employed by the higher professing veterinarians of the present day." Again, p. 567, "a veterinary surgeon (Mr Turner I suppose he means) took notice, in the course of his post-mortem researches, of the diseased state of the *coffin-joint*, and in making it generally public, gave it the sounding title of Navicular Disease." And again, p. 568, "In this hard and fixed state, it (the horny sole) offers a solid resistance to the pressure of the *coffin-joint* from above, instead of yielding to it as it ought to do. This is enough to occasion inflammation of *that joint*, and its train of bad effects." After these quotations, will it be believed that the disease in question is not situated in the coffin-joint; that the term *joint* is not applicable to the part affected; that, in fact, it is a distinct and separate *cavity*, in which the disease is found? The navicular bursa mucosa is the seat of the disease; and, as a cavity, it has no communication whatever with the coffin-joint. Now, let him look again at my essays, and see what is there described as the seat of the disease;—certainly not the coffin-joint, which I repeat we ought to be able, when it is diseased, to distinguish from the disease in question; and, if Mr Clark *has* looked into the coffin-joint for the disease, then I say again I am surprised he has found it in so large a proportion.

But farther, where he ventures to say what are the diseased states of the part affected, he is still in much confusion, showing evidently that to him this disease is indeed "a rare thing." "Adhesion of the tendon to the bone is perhaps (he says) the most common occurrence; but a diseased shuttle-bone is in reality a rare thing." Pray, how can adhesion take place betwixt

the tendon and the bone, without involving the bone in a greater or less degree of disease? Is not the very adhesion a diseased action? The bone, in every case of adhesion, partakes of the disease; and, sooner or later, in some degree or other, whether adhesion takes place or not, becomes diseased. If this were *new* to Mr Clark, he would indeed be a superficial pathologist.

I would not press Mr Clark so hard upon this point, were it not, as he expresses it, "a matter of some consequence;" but, as a knowledge of the disease is half the cure, I must insist that we ought to be able to distinguish the difference between diseases in the coffin-joint and in the navicular bursa. The situation of the diseases are different, their symptoms are different, and their effects are different. And, when we know the nature of the disease, we are more likely to treat it with success; and, if not, we are at least able to give a rational reason for the obstinate nature of the lameness, instead of the vague and undefinable ideas attached to contraction of the hoof, which, in my opinion, has proved a greater bugbear to the profession than ever navicular disease has done. If contraction alone were the cause, we could remove the disease at once, by the simple enlargement of the hoof; but this Mr Clark well knows can seldom be done; and if, in some cases of confirmed lameness, with contraction, the disease is subdued, it is, I am at liberty to say, as much owing to those remedies which are used having removed the inflammation in the bursa, as the relief given to the contraction of the hoof. Mr Clark asks what produces lameness, and replies the iron-hoop, the shoe; but he will be pleased to observe, that until he has shown how the shoe produces the inflammation in this part, he has only made an assertion. He will tell us that inflammation is the effect of the constraint produced by the shoe; but let me ask, Do we not find thousands of feet contracted, and that to the last degree; without obvious lameness? I say obvious lameness, because we are not to quibble about subtleties which do not admit of full proof; and do we not meet with numerous cases where there is that kind of lameness which is said to be the effect of contraction, where the feet are not perceptibly altered in their form? Yes. Mr Clark reluctantly admits, that such *may* occur: that in "certain coarse feet," a term, by the way, too coarse for scientific men to use, "this effect (the contraction) is not very obvi-

ous;" that, in such cases, the disease is produced by the resistance offered by the sole not descending. I am quite aware that a hard thick sole will produce, in some instances, inflammation in the sensible sole, and that various effects may arise from it. But it unfortunately happens for this view of the case, that in those feet where there is little contraction, there the soft elastic frog and the almost insensible tendon in an unaltered state, are interposed between the bursa and the sole.

But why reason thus? Were this the only bursa or joint liable to disease, we might be led to suppose that Mr Clark's *assertion* was correct; but when we find that the bursa at the fetlock and hock, and also most of the joints, are liable to disease precisely similar in appearance and effects, are we not bound, by such demonstrative evidence, to conclude, that as this bursa is, like other synovial capsules, placed in analogous situations, similarly constructed, and performing similar functions, it must be liable to similar diseases, and these diseases, too, arising from similar causes? Now, if Mr Clark has not seen disease in other bursa, I could show him a variety of specimens, sufficient, I think, to satisfy him as to *their* liability to disease. And such being the case, how will he account for disease in these parts? Are they bruised, or has contraction of the hoof any thing to do with these parts? Can the hoof press on the fetlock synovial capsule, or on that of the profundus tendon, as it passes over the hock? No. And why should he be so reluctant in allowing a capsule, the parts of which are perhaps more in action than the others, to be liable to similar diseases? To deny these positions, is to set at defiance every principle of anatomy, physiology, and pathology, on which is founded my "belief."

In regard to the rarity of the appearances in this disease, I must observe a very singular fact, that the first visit I made to the tan-yard, after reading Mr Clark's letter (to make a post-mortem examination of a horse that had died), and the very first foot which I took up proved to be one affected with this disease; and this foot was selected simply from its external appearance. And although I had no information regarding the feet, or whether the horses to which they belonged were lame or not, I found that out of other three feet which I examined, one proved also to have the same morbid appearances; and further, although eight

days had not elapsed from meeting with these two specimens, another came into my hands, and that, too, a case in which I ventured to predict the state of the parts prior to death. And I must further remark, that, in two subsequent visits to the tanners, in company with several of my pupils, of seven feet selected as worthy of dissection, simply from their appearance and form, without any knowledge of the horses, or whether they had been lame or not, four of these proved to be affected with the same disease.

But I must hasten to his second point, and endeavour to show why I am of opinion that all shoeing, whether *good or bad*, will produce the disease. Mr Clark seems to feel very sanguine about his expansion-shoe, and appears surprised I have said so little about it. Now, I thought I had said enough; I said, in fact, that in principle it is the best, but in practice it has some defects in common with other shoes.

It is attached with nails, and these nails may pinch the sensible parts within, by displacing the soft parts of the hoof inwards. Although this has been denied by the late Mr Peal of Dublin, I am sure every practical man in the profession will bear me out when I assert that such is the fact, and which I can also prove by specimens of morbid anatomy; and so sensible was Mr Clark's uncle of this, that, to prevent such almost unavoidable occurrence with the expansion-shoe, he invented a stretcher, and published an account of it for the use of those who may apply the shoes. Now, in this way, contraction may be produced even with the expansion-shoe. But, besides this, unless the jointed shoe were composed of elastic materials, it would not admit the equal expansion of the different parts, an argument which has been repeatedly urged against the jointed shoe, and which I will not therefore insist upon. But it is besides liable to the objections of the common shoe in the irregular pressure that may arise from it, if not properly bedded; that is, if it rest too much on any one part of the hoof, the effects which follow such extra pressure will be inflammation and its consequences. Besides, this is more likely to occur with the jointed shoe than any other, because, unless the joint is made to play horizontally with a degree of mathematical exactness (scarcely to be expected in the construction of the shoe, even although it is made of cast

iron), the contraction or expansion of it may cause an increase of pressure upon either heel, which may produce inflammation and all its consequences. And, unless Mr Clark sets up a claim to infallibility in his workmen, I cannot see how these circumstances should not have occurred in the course of his practice. Where, then, is the impossibility of the disease occurring with his expansion-shoe? Mr Clark surely will not deny that inflammation could be produced by the causes I have stated; and if, therefore, he has not yet had the misfortune of finding a horse going lame with the expansion-shoe, he must not suppose it is therefore perfection; he may yet have more experience. And with regard to his testimonials, I am bold to say that there are hundreds of practitioners who could tell the same tale in regard to their different kinds of shoes; aye, and get as many testimonials as Mr Clark. How rare, for example, does the "fettering" system affect farm horses in slow work; how seldom does it occur in ponies of light weight. How is it so little known in France and on the Continent, amongst horses that go much upon their haunches, and have high action, but which put their forefeet to the ground with *less force* than our well-bred horses? If the fettering system was so very destructive, we should have all our horses lame in a short time. But let Mr Clark look back to the case I mentioned on a former occasion, and explain how with "fettered" shoes the horse's feet continued perfect when he was otherwise worn out.

We are told that Mr Clark has "used expansion-shoes for several years on a considerable number of horses," and that he has never seen, "*while wearing them*, a single horse become affected in this manner"—In what manner? In the manner he confessedly does not understand. But mark the caution of the expression, "*while wearing them*." Few horses having, it would appear, used these shoes constantly, if they fell lame, it was always after they had been wearing common shoes; to them the lameness was ascribed—the fatal contamination of the common shoe.

Mr Clark asks, very triumphantly, why the ancient Roman veterinary writers have not mentioned this disease, if it arises from the "pace," and at a time when their pace was as *rapid* as ours, without shoes? But is there any thing wonderful in

the Romans not being aware of the existence of a disease about which even Mr Clark himself is not satisfied? Will he pretend ignorance of the fact, that, even in the present day, it is commonly supposed to exist in the shoulders? And is he really serious when he says, that "where no unnatural restraint of the foot is permitted, there will be *no inflammation and no subsequent disease?*" Will not the "pace," will not over exertion, induce inflammation, and that too in such a degree as in some instances to threaten separation of the entire hoof, as in acute founder, and why not in the degree and in the part I have treated of? If Mr Clark does not believe it, I do; and have had proof by "real experience."

Let us here, however, inquire into the expansion of the foot, before going farther, and see whether we have not been making a noise about nothing. What is the amount and nature of the expansion of the hoof? It appears to me that we have been led too far by the expansive doctrine. What is the action of the foot when the weight is thrown upon it and the hoof unshod? We see the under extremity of the crust coming in contact with a hard surface; and if on a pavement, the edge of the crust will embrace it with increasing firmness, as the weight increases upon it. Now it is said that the hoof expands when the weight is thrown upon it; but, unless perhaps where the frog is prominent, if pressing on a surface such as a pavement, or that of a smooth Macadamised road, where, I ask, would the expansion take place? I do not think there would, in such a case, be play to any great extent between the lower edge of the crust and the ground, so long as it is a fixed principle in mechanics, that the increase of friction retards motion.

But besides this, the laminæ on the interior of the crust are so many springs running downward and inward; and as the weight is thrown upon them, their action is to draw the sides in some degree together. But observe how nature has provided to guard against injury in such circumstances; the blood, by the peculiar construction of the vessels, escapes from the foot by innumerable channels, and the increased portion of the foot which is forced down by the superincumbent weight, is thus allowed to enter within the hoof, without any material expansion of it being required; and thus we see that the hoof becomes

fettered independent of shoeing ; and of this Mr Clark is not altogether ignorant, as he has alluded to it in the Farrier, without, however, offering any remarks upon the subject.

Let us next inquire into the principles of the common shoe, so much condemned by Mr Clark. It is a defence to the hoof, attached by means of nails, which extend round one half of the foot, or rather half the circle of the hoof. It is not fair, therefore, in Mr Clark to stigmatize the common shoe as rendering the hoof "as rigid as a block of wood bound round with a ring of iron." The hoof, at most, is only bound half round ; it is still allowed the play of its expansive properties behind the nails ; the common shoe is at most only a half ring, in as far as the fixing is concerned ; and all the boasted improvement of Mr Clark's expansion system, consists in dividing this half ring into two quarters. This is the mighty improvement—this, the *ne plus ultra* of the art of shoeing. I have admitted that the jointed shoe has its advantages ; but, in the mean time, let Mr Clark consider what play can take place in the jointed shoe, when it is resting on a firm surface below, and pressed upon by the hoof and the weight of the horse above ; that is not a likely time for its expansion. I do not deny the elasticity of the hoof—Who ever did ? I allow there are circumstances where the hoof is expanded, and where it is advantageous that it should be allowed to do so with freedom. But while so much attention has been paid to its expansive properties, why should its opposite properties be so much overlooked ? Has the contractile power been given to the hoof in vain ? May not the fixed state which must take place in the crust, when in contact with a hard flat surface, even before the hoof has been shoed, require that the horny sole should be compressible to allow it to descend when pressed upon from above ? Do we not find, when hoofs are very wide and open, that the sole is apt to descend in such a degree as to become diseased, and that, too, in defiance of what the common shoe can do to press up the sole and contract the hoof ? But not only does the friction which takes place between the under edge of the crust and the ground, prevent expansion at the moment of greatest pressure, and when the greatest necessity for such expansion apparently occurs, but the heels of the hoof run in a direction obliquely forward un-

der the superincumbent weight, in such a manner, that instead of expansion, there is, of necessity, a natural tendency to contract at these extreme parts. Methinks I hear Mr Clark say, What doctrine is this which is brought forward? Is every established opinion to be subverted to support an absurd theory? No: but these remarks will perhaps lead Mr Clark to consider better what he advances in regard to a subject about which we chance to differ.

Having formerly shown that this disease is similar to what occurs in other parts of the animal, I only recommended the ordinary treatment for such cases. A specific was not to be expected. I certainly expected none. On the contrary, I have been led to doubt the merits of Mr Clark's specific—the expansion-shoe. Although I have not enlarged so fully as I might have done on many parts of Mr Clark's letter, I shall content myself with only farther remarking, that whatever may have been the discussions of the London Veterinary Medical Society upon the disease in question, my opinions were not even alluded to there; and whether Mr Clark thinks so or not, I am induced to believe that most of your readers will be able to draw this conclusion from the discussion—that neither the expansion-shoe, nor any other, will be sufficient to prevent the disease, so long as the animal is subjected to “a killing pace upon the road,” and that combined with the other disadvantages under which this animal is compelled to labour. I am, &c.

REMARKS ON CERTAIN DISEASES OF SHEEP. *By the Ettrick Shepherd.*

THE most destructive and ruinous disease among sheep at this time, over all the south of Scotland, is that called the *Pining*—a very descriptive Scotticism, from the verb, for no creature can have a more languishing and miserable look than a sheep affected by this malignant distemper. Well may I describe it, for, in the course of the last nine years, I have lost upwards of 900 sheep by its ravages. It is quite a new disease on the Border, for I was twenty years a shepherd and never saw an instance

that I can remember of with certainty, nor did I ever hear its name save from Galloway, where it was called *The Vinquish*, and where it has been prevalent for ages. It was likewise known long ago in some of the districts of the middle Highlands.

It is a strange distemper. On the genuine pining farms, sheep do not take it by ones and twos, but a whole flock at once. It is easily distinguished by a practised eye, the first symptoms being lassitude of motion, and a heaviness about the pupil of the eye, indicating a species of fever. I wish I had science to describe it in a pathological manner, which I have not, and therefore shall not attempt it; but, at the very first, the blood is thick and dark of colour, and cannot by any exertion be made to spring; and when the animal dies of this distemper, there is apparently scarcely one drop of blood in the carcas. It lives till there does not appear to be a drop remaining, and even the ventricles of the heart become as dry and pale as its skin. This simple fact may, I hope, enable men of science to comprehend its nature.

It is most fatal in a season of drought; and June and September are the most deadly months. If ever a farmer perceives a flock on such a farm having a flushed appearance of more than ordinarily rapid thriving, he is gone. By that day eight days, when he goes out to look at them again, he will find them all lying, hanging their ears, running at the eyes, and looking at him like as many condemned criminals. As the disease proceeds, the hair on the animal's face becomes dry, the wool assumes a bluish cast; and, if the shepherd have not the means of changing the pasture, all those affected will fall in the course of a month.

In 1823, I chanced to go to the hill one morning in June, not the least aware that the pining had set in, and found upwards of twenty scores far gone in it, and new ones getting affected every day. This was a cheering discovery! What was I to do next? I went and took two fields of young clover, and changed the stock on these every fortnight, which, I believe, saved a part; but, in spite of all I could do, I lost fourteen scores of them.

I know not what medicine might do, but there is only one effective cure known in this country, which is a change of pas-

ture to one of more succulent herbage. This is a certain remedy when resorted to in time; and if the sheep are laid on clover or limed ground the cure is the quicker. If ever the bowels are opened, and marks of a slight flux appear, then the animal is safe, and the necessary change has taken place in the constitution. Nevertheless, these sheep will be the first to take it again. They are sure to take it again either that year or the next; so that, upon the whole, a farm cannot be subject to a more ruinous distemper. Few of the ewes that are affected in autumn have lambs next year, or they have them far too late to be of any value.

The farms most liable to the disease are those deep grassy farms which were in former years wholly overrun with mole-hills; and which farms are intermixed throughout with great flats and ridges of white and flying bent. These last are the bane of the flocks, when the surrounding bogs are not rich and succulent enough to counteract the costive effects of the other; and exactly in proportion as the succulent and laxative herbage prevails over the dry and benty, the effects of the pining will be less felt. On steep and rocky lands, where the herbage is sweet and short, the disease does not exist; and on hard heathy lands, which are generally intermixed with green little stripes, called gairs, it is scarcely known. But there are few of these deep strong grassy farms, which prevail so generally over the southern districts of Scotland, on which there are not some parts which have to be constantly watched, and the sheep turned from them pointedly, once or twice every day, else the pining is sure to make its appearance. Thus, in dripping seasons, shepherds, by strict attention in changing the sheep's pasture every day, may in a great measure prevent its ravages; but in a dry season, without infield-land sown with succulent grasses, or limed, it is impossible to prevent it.

It will thus be manifest, that it is only on such farms as are all of the same intermixture of grass and bent alternately, where rough husk bent is the prevailing plant, and where, of course, changing the flock from one part to another can produce no effect;—I say, it is only on such places as these that its pestilent effects cannot be surmounted. But over all the Border districts there are nine farms out of every ten which have to contend with

it, on a larger or smaller scale; and it being a new enemy arisen, in otherwise hard and pressing times, too much attention cannot be turned towards it. If these remarks should induce any gentleman, skilled in veterinary diseases, to take up the subject, it might lead to some expedient of great importance. It has always been my own opinion, and the opinion is general among shepherds, that the extirpation of the moles was the primary cause of it; but having mentioned that in a former paper, I need not insist on it here.

I believe there are very few diseases, among such animals, which are not more or less contagious, and it is supposed that when there is a degree of fever, the distemper is always so. I cannot help here mentioning one sort of infection, which has always appeared to me one of the most extraordinary and curious in nature. It is, that when a severe death takes place among lambs after castration, the ewe lambs take it too, and die inflamed in the same manner and the same parts. But I was going to observe, when this came across me, that I think the pining is *not* infectious. Although the amazing rapidity with which it spreads among some flocks might lead to the conclusion that it was as contagious as fire, yet, after dear experience, I am convinced that it proceeds wholly from the food; because, on lands where it is but partially known, and little regarded, a straggling sheep will take it, and cling to its dry costive spot till it dies, and yet none of the rest be affected by it.

The lands that are now most liable to this disease, were once in the same manner liable to the rot. In my own remembrance, the lands of Eskdale, Ettrick Forest, and Tiviothead, which now produce the best sheep in Scotland, the East Border scarcely excepted, were once miserably infested by the rot; so much so as to be held of very little value. But gradually, as the draining of the sheep pasture proceeded, the rot was extinguished. Then, to preserve the drains, the moles were extirpated; and, ultimately, the rot was superseded by the pining. These diseases are very like one another, the animals affected having much the same appearance; and yet the diseases are radically different. In the rot the blood becomes serous or thin; in the pining it is thick and stagnant. In the rot the liver is

uniformly infected and foul, its ducts being crammed with fluke-worms; but in the pining the liver is sound.

There is only one other disease which was quite unknown to shepherds in my early days, and it is curious how it came into this district at the very same time with the other. It is *the foot rot*, which is an inflammation of the hoof. It causes excruciating pain to the animals, soon begins to suppurate, and, if not duly attended to, ends in mortification of the parts. It is highly infectious, proceeding, it is supposed, from certain animalculæ; for it has often been known that the driving of an infected flock over part of another farm has brought it upon the flock of that farm with the utmost virulence. And yet, it is rather unaccountable how one of a sheep's feet will often be miserably affected, and the rest all whole. This is far from being uniformly the case, yet it is often so; and why the poisonous animalculæ do not seize on them, having so fair an opportunity, is rather a puzzling question. It may, perhaps be answered by supposing the affected foot to have been previously in a foul and scirrhus state.

However that may be, the distemper is doubtless an infectious and most virulent one; and though not absolutely fatal, it not only prevents the thriving of the animal but produces a rapid decay. There is no other disease among sheep which requires greater attention from the shepherd; for though it is not difficult to cure, it cannot be cured without the most strict attention. It is first necessary to pare all the hoof from the affected part, and carefully to remove all the ulcerous matter; then to wash it, first with soap and water, as hot as the hand can bear, then with stronger liquid, such as muriatic acid, or a strong urinary wash. Some farmers anoint or dress the foot with ointment of red precipitate; some with butter of antimony; others with mercurial lotion, and mixtures of many ingredients. But the truth is, that it is little matter which of these hot ingredients you use, or whether you use any of them or not, for by daily washing and cleansing the infected parts from all ulcerous matter, a cure will soon be completed. These fierce ingredients, without doubt, effect a quicker and more violent cure, but the disease is easily cured without them. Care and

punctual attention alone are requisite; and without these the health of an infected flock is ruined. It is, moreover, most cruel to neglect the poor animals, for, of all pains, that which they suffer seems to be one of the most intense: all their motions manifest how much they are suffering; and the sudden falling off of their carcasses is remarkable. After the foot is fairly cleansed, I never tried any cure more effectual than dipping it among boiling tar, which forms a shell round it, excluding the external air, and effecting a cure in a very short time. At shearing time, then, when every sheep's feet are naturally examined, and when there is always boiling tar standing ready for marking, I would recommend, in preference to all other applications, simply the dipping of every affected foot, after paring and cleansing, in the boiling tar. The experiment is easy, and I answer for its salutary effects.

There are many other diseases to which this useful animal is subject, but these two are the only modern ones known to me, and all the others being fully treated of in that celebrated work *Hogg on Sheep*, it would not answer to recapitulate them here, though I certainly could describe some of them more to the purpose than I did nearly thirty years ago. But there is a third, though I daresay it may have prevailed among sheep since Laban first stocked the mountains of Padanaram with them, and the patriarch Job took it into his head to lay 14,000 on the thirsty mountains of Uz;—by-the-by, I do not wonder he lost them all, for I have little doubt it was the *pining* that came amongst them, and cut them all off:—well, but supposing that the itch has been among flocks ever since that period, yet, so much has it prevailed of late years in our own country, that, in so far as relates to the Border districts, it may be treated as a new disease.

During the first thirty years of my life, twenty of which I was a shepherd, I never heard of or saw a scabbed sheep. So punctually was every sheep smeared with tar and butter, that really there was not such a thing in the country. It was always less or more, indeed, among the Highland sheep, but there was no such thing, either in the south of Scotland or north of England. But now, the thousand experiments which have been made in the true art of salving, have spread the *Scotch fiddle* to an omi-

nous extent among the flocks, so that the old cant phrase—tag-rag and bob-tail,—could never be so properly applied to the poor animals.

Nothing can be more annoying than, at one of our pastoral societies, to hear the farmers debate about the proper modes of salving sheep. Every man has his own way, and yet every mode is the complete perfection of the art, and all the others are wrong. It is something like religious tenets, always the nearer they approach to one another, their difference is the wider and more inveterate. There is no infection amongst one of their flocks, neither vermin nor itch : no, not a single instance. While the fact is, that a certain tag-rag and bob-tail may be seen amongst them all. For a little variety, I shall here set down, verbatim, a dialogue that passed at the close of a pastoral meeting.

Poet. “ Now, callants, I really wish ye wad be done wi’ this endless business of the salving, an’ let us hae a sang, or some fun, or some rational conversation. Come, we’ll put it to a vote, an’ end it. What do you say, sir ?”

1st Farmer (taking a snuff). “ They may a’ say as they like, but its my opinion, they’ll hae to come a’ into the auld way at last, an’ be content to do as their fathers did. Just to smear their sheep wi’ tar an’ butter, an’ meing a wee better.”

2d Farmer (snapping his fingers). “ Whew ! Hey, man, is that a’ the length that ye’ve won yet ? Hout, hout ! If ye are sae auld-fashioned as that, we’ll no hear you speak ava. Ye canna vote, sir ! Ye hae nae right to vote for an auld explodit custom like that. I’ll tell ye what it is, sir, an’ take ye this up as ye gang along. I’ll smear my sheep wi’ raw turpentine an’ coco-nit-oil, an’ I’ll be as hivvy as you, sir, smeared wi’ your terr an’ your butter ; an’ sell at *double* the price, too. Now ! take ye that, man, wi’ your terr an’ your butter ! Whew ! Terr an’ butter, faith !”

3d Farmer. “ I beg your pardon, sir, but I wad rather say, that butter itself, mixed wi’ a little o’ the spirit o’ terr, were the best an’ safest salving o’ the twae.”

4th Farmer. “ Naething like it. Half butter an’ half spirit o’ terr for me. That’s the proper dose.”

1st Farmer (taking a great snuff). “ Was’t the proper dose

when ye fand twenty o' the scabbitest anes a' lying dead at the back o' the dike neist morning?"

4th Farmer. "It's a confoundit lee, sir, said it wha like. Na, ye needna a' gaffaw an' laugh, for I say it is a great confoundit lee, an' I'll prove it ane. There wasna *ane* o' the hoggs deit, but some that deit o' the sickness! L——, ye ken there was a wheen o' them deit o' the sickness, an' they had some black stripes aneath the skin, there's nae doubt. It's needless to deny't. But to say that I killed twenty scabbit sheep, a' in ae night, od! I'll——"

5th Farmer. "Stop short, my good fellow. Stop, and let me speak, will ye? Gentlemen, no to gie any fixt or positive opinion o' my ain, but just as my friend Airchy said aince. Ah! he was the queer ane! But what wad ye say to cocko-nit-oil an' train oil mixt thegither theirsels twa?"

6th Farmer (drunk). "What's the man saying? What's that ye're after now, buoy? Cocko-nit-oil an' train oil! Dimna ye think kirn-milk an' hen-pen wad answer as weel? I think I wad prefer it for my part. Eh!"

Poet. "The vote, the vote. Come, let us hae the vote. This will never do. This smearing is turned the curse o' every company a' o'er the country. I'll force the votes and be done with it. What do you say, sir?"

"Terr an' butter."

"No, no! score him out, score him out. No vote. I say, sir, an' I'll maintain *what* I say, I say raw turpentine an' cocko-nit-oil."

"Very well. Go on; what do you say?"

"Butter, and a dribbling o' the spirit o' terr."

"No, no; nane o' your dribblings. Confound a' dribblings. I say half an half."

"Very well; half an' half. What do you say, sir?"

"I say terr an' butter, buoy. She has studden the test langest."

"Cocko-nit-oil an' train oil."

"Train oil and butter."

"Hog's lard an' rozet; the finest salve o' the whole."

"I stand by hog's lard and turpentine."

"And I by butter and gallipoli oil."

“ Very well. George, what do you say ?”

12th Farmer. “ I say, Mr Chairman and Gentlemen, I’ll gie ye my vote cheerfully and decidedly ; but never head, never head, ye see. I maun first gie ye my eedies on the subject, in justification o’ what I propose. But, ye see, never head, never head, for I’ll no be lang. Now, my eedie’s this, Gentlemen, that as lang as the woo brought the half o’ our rent, whilk I mind well o’ it doing ; nay, as lang as it brought the third, or even the fourth o’ our rent, it was worth our while to risk a little on the sheep’s carcass, to improve the woo. But now that it is turned into sicken a mere drug, as to be hardly countable ; really, Gentlemen, it is not worth our whiles to haud the poor creatures fiddling, an’ clawing, an’ shaking their tails ony langer. That’s my eedy on the subject ; an’ I vote for terr an’ butter to the last. Terr an’ plenty o’ ony other meingin ; I carena what it be, but terr for the ae half, at ony rate. Never head, never head, ye see ; terr an’ butter carries the vote.”

This is a literal fact, there were not two votes for one salve, except that three old experienced hands carried the tar and butter.

I was once the greatest advocate in Scotland for white salving ; and harped upon it, publishing in every paper and journal to which I had access, the singular advantages which would accrue to the farmer from the adoption of the practice ; and, I believe, was instrumental in drawing attention to it. I began fearlessly with the experiments myself, but on too large a scale, and had cause to repent it. My fixed opinion now is, that so long as the wool remains at the present low rates (and while the free importation system remains unaltered, it is to be feared, there cannot be a material improvement) it is the safest and most comfortable way for the stock, for the farmer, and for the shepherd, to mix with a good full proportion of grease, and salve with tar. The history of this process of smearing is rather curious ; but that I mean to reserve for another paper, on the Natural History of the Sheep.

As for the appearances, progress, and cures, for the itch, they are now so universally known, that to describe them minutely would be of much the same utility as to give a man directions on the road he has just travelled ; and it not being a

very deadly distemper, it is often more calculated for fun than a sermon. It is first indicated by small white spots on the wool. These make their appearance on lambs and sheep after shearing-time, a good while before either the animal begins to scratch, or the smallest pustule can be felt with the finger; and, on sheep or lambs that are for sale, by irritating these spots a little and rubbing them with mercurial ointment, the distemper may be kept down and entirely hid from observation for a long time. But, even in its worst stages, it is easily cured at two periods of the year: shearing time and smearing time. In the intermediate periods it is more difficult. Between shearing time and smearing time it is almost impracticable, both on lambs and ewes, for the wool cannot be shed, neither can the ointment be rubbed through it. At these two periods, then, it behoves the farmer to look strictly after the state of his flocks, and the cure is easy. Sulphur is at all times the safest and surest cure, if mixed with oil or grease, to keep it from drying on the skin or wool. At clipping, a bath of oil, sulphur, and tobacco liquor, is a certain cure, only the bath should be very general to be certain. At smearing time let every man salve with his own favourite mixture; but put a pound of sulphur in every tub and he is safe. I once smeared 700 ewes twice over, once in September, and again in December, and they were completely cured; and I used nothing but the common salve of tar and butter. I got a great deal more for my wool than on common years, as it had a facility in bringing down the weighing-board quite unexampled.

J. H.

NOTE BY THE EDITOR.

WE feel much indebted to our esteemed correspondent, for this account of the remarkable disease of the sheep, which has recently become so fatal in many districts, provincially termed the *Pining*. The sheep is constitutionally of such a temperament, that a departure from its natural habits is frequently productive of disease. The sheep seldom drinks, except when labouring under certain kinds of disease: it discharges little urine, and that generally acrid and injurious even to vegetable life; and it perspires or

secretes much of an oily or greasy substance. Most, if not the whole, of the diseases incident to sheep, may be traced to climate, food, and treatment. Under circumstances suited to its natural habits, the sheep is generally seen to enjoy uninterrupted health. But a departure from the proper mode of treatment is known soon to act injuriously on the animal's constitution: hence the vast train of fatal diseases which frequently ensue from confining it to too wet situations of pasturage; from giving it too astringent or too laxative food; from its being much disturbed, or, under certain circumstances, from a want of proper exercise.

The disease called Pining seems to arise from an enervated and costive habit of the animal, which may be produced by a want of proper exercise, in conjunction with feeding on pastures of an astringent nature. The principal districts in which this disease is found to prevail, are the green pastures of the Cheviot mountains, the chains of hills running through the south-west parts of Roxburghshire, the pastoral districts of Selkirk and Peebles shires, and some other districts of Scotland, as Galloway. Under the old practice of keeping the sheep in flocks, or as they are termed *hirsels*, of weaning the lambs in the months of July or August, and afterwards of milking the ewes for eight or ten weeks, the pining was unknown in most of these districts; but, under this mode of treatment, the sheep were frequently subject to diarrhoea,—a disease diametrically opposed to pining. The farmers of these pastoral districts have generally improved upon the older methods of keeping their sheep. They find it to be more profitable to allow the whole flocks to pasture together indiscriminately and undisturbed. The lambs remain unweaned until they wean themselves, which generally does not take place till the month of December. By this mode of management, the ewes and lambs are found to be of a higher comparative value than all the sum realized by the sale of cheese made from the milk of the ewes; besides, the ewes are not subject to various accidents arising from so frequently collecting them together for the purpose of milking.

But, under this undisturbed state of management, in all cases where dry astringent pastures are produced, such as on the syc-

nitic porphyry of the Cheviot range, the pining made its appearance; and its ravages have been forcibly described in the preceding essay. That such pastures promote this disease, is further strengthened by the fact, that it is more common in dry than in wet seasons; and most so at that season of the year when, by the influence of the sun, the plants are less juicy; or, early in autumn, when the grasses which have pushed to seed become less succulent. The disease is not known on the whole of the clay-slate range of the Lammermoor Hills, where heath prevails, occasionally interspersed with green pastures, and where the *hirseling* practice is pursued. Nor is it known to exist in general on green succulent pastures, or even heaths, growing on calcareous or sandstone grounds, where the nature of the food, and the exertion of the animal in procuring it, appears to counteract the progress of the disease, arising from the inactivity of its digestive function.

If we suppose these to be the predisposing causes of this disease, the preventive or the remedy will suggest itself, either under the head of food or treatment. Should it be deemed inexpedient to adopt the mode of keeping the flocks in hirsels, a change of place, and consequently of food, is necessary to accomplish the purpose. The salutary effects of a variety of food on the animal system are well known. When sheep affected with this disease are put upon a heath, it has frequently the desired effect; but when the animal is much overcome with the disease, its state of languidness may prevent it from taking such a quantity of this food as will produce a reaction upon the animal functions. The most effectual cure, therefore, in all cases, is a change to a more rich and succulent pasture.

Whether it be that the mountain varieties of our sheep possess weaker digestive organs than the larger sized sheep, or that, from some other unknown cause, they are more subject to the costive habit which produces pining, it is certain that the Cheviot sheep are more subject to it, under the same circumstances of feeding and treatment, than the Leicester. One of the most extensive and intelligent farmers on the Cheviots informs us, that he has often observed this circumstance in his numerous flocks. On some of his farms, one portion of his

flock are Cheviot sheep, and the other a cross nearly allied to the Leicester; and he has frequently observed a great part of the Cheviot sheep affected with pining, while not a single one of the other breed would have the slightest symptom of the disease, though they pastured indiscriminately together. He says that he is always enabled to cure those that have become diseased by changing to a richer pasture.

A very singular opinion, to which Mr Hogg referred at length in a former paper, is, that this disease was introduced or has been extended by the extermination of the mole. We conceive it extremely probable that this may, in combination with the other circumstances to which we have referred, tend to propagate this malady, and it may be accounted for by the fact of fresh earth being brought to the surface by this animal. Now, this earth, whether spread regularly by the farmer, or casually by the sheep, or even allowed to remain in the state in which it is thrown up, covers annually a very considerable portion of the surface of such farms, and, as we know by the analogy of tillage, must tend to produce a greater variety, and we may believe a better species of herbage.

We have received a very intelligent communication on this subject from Mr Laidlaw of Bowerhope, in Selkirkshire. We would have given this paper at length, but that the subject is in a great measure anticipated, by the paper which appeared in our former Number.

Mr Laidlaw states, that before draining was begun in the district to which his letter refers, moles were seldom to be found except in dry loamy soils, the finer parts of which were termed *green gairs*, from the darker shade they assumed, in consequence of their superior fertility. The boggy soil was then too wet and adhesive for the subterranean habits of the mole. But, after the boggy land was drained, the moles also became very plentiful in that kind of soil, and it was then thought did considerable damage, by letting out the water with their cross-roads, as well as spoiling the sides and filling up the bottoms of the drains. It was in consequence of this that the hue and cry for the destruction of the moles became universal; and so diligently was the exterminating system pursued, that in most places the molehills soon entirely disappeared.

Mr Laidlaw asserts, that the consequences were precisely such as have been often represented. The *green gairs* disappeared; the soft succulent plants were found to languish and die, and their name became almost extinct in the catalogue of the plants of the choicest pastures. These frequently became coarse, harsh, and unpalatable. In the place of the mountain-daisy, the sweet-scented vernal grass, the healthy sheep's fescue, the rich native clovers, the aromatic yarrow, the spreading rib-grass, which, says he, with their kindred plants delighted the sight, a quite different and inferior set of plants frequently took possession of the soil, such as moss and lichens, tufty hair-grass, bent, and the like. Arguing that this had been produced by the want of that constant deposit of fresh earth which is spread upon the surface of the ground by the mole, he contends that these animals ought not to be exterminated. "It is an approved and necessary practice in rural economy," observes he, "to multiply and vary the objects of cultivation; and not less important is it in the case of our pasture lands, to multiply and vary the herbage which they yield. And how can this be so readily and cheaply effected as by allowing the mole to labour for us. Who has not heard of the very pithy but selfish prayer, 'Lord, turn the world upside down, that the poor people may get good of it!' But the design of this prayer was never more completely exemplified in the political world, than in this inanimate part of creation, and simply through the labours of the mole. He, in his search after food, literally turns the world in which he dwells upside down; and, by this means, he brings into activity those portions of the soil beneath, which, but for his labours, would have remained useless. If it be asked how we are to dispose of those numberless little heaps which he raises upon the surface, we answer, that no injury results from them. Even the sheep and lambs, in the active exercise of playful instinct, will spread them abroad for us; or, should we not choose to trust to such capricious labourers, a turnip-hoe, or other simple implement, is always at hand."

But Mr Laidlaw, not contented with general arguments upon this subject, endeavours to support his opinion by adducing specific cases in support of it. In an especial manner he contends, that the disease to which we have referred—the pining—

owes, if not its origin, at least its more general dissemination, to the extirpation of the mole.

“ In the parish of Overcassock,” says he, “ on the farm of Eskdalemoor, possessed by Mr Glendinning, the destruction of the moles was followed by the introduction of the pining. Mr Glendinning states, that after discontinuing the practice of mole-catching, the pining disappeared from his farm. The next case I have to cite, occurred in the same parish, on the farm of Meedlaw, possessed by Mr James Bryden,—the stock on whose farm was known to be one of the best and healthiest in the district, as the many premiums he has received from different societies testify. Five or six years ago, Mr Bryden, for the first time, employed a molecatcher; the man did his duty to admiration; but no sooner were the moles destroyed than the pining began. Mr Bryden had at once discernment enough to discover the cause and discontinue the practice. These two farms consist of rough grassy land; the two other farms to which I have to advert, consist of comparatively thin, or hard land, as we term it; part of them is covered with heath, part consists of light lea ground, and a part of thin boggy soil. The first of these is possessed by a gentleman who, for industry and intelligence, is surpassed by no one. He engaged a molecatcher at so much per annum during his lease. The man fulfilled his bargain to the letter, but the molehills were no sooner gone than the pining made its appearance. The green gairs were overrun with a species of moss, the sward of grass got thinner and of a less nourishing quality, the bogs became coarse and wild, and a uniformity of pasture, which ought always to be avoided, was the immediate consequence. He, too, gave over the practice of catching moles, and allowed the molecatcher to enjoy his bargain as a sinecure, during the rest of his lease.

“ The next case I shall mention is confirmed by the test of experience, during a period of thirty-four years. In the course of the first lease of ten years, the ground got a little, and only a little, draining, and the moles were never disturbed, except when Oscar chanced to give chase to such as ventured out of their hiding-places. The sheep then thrived very well; none did better in the district. In the next lease of ten years, the ground was well drained, and the catching of the moles was

contracted for at so much per annum during the lease. The undertaker was luckily a man who could exercise a little cunning in his calling. He readily foresaw that if he cleared the soil of moles altogether, he would but imitate the owner of the goose and golden eggs; and, of course, although he occasionally displayed great bundles of mole-skins, he still left enough of moles in the soil to keep it and dress it. In the beginning of the next lease of ten years, the molehills were carefully spread throughout the farm; and for the following four or five years the sheep did very well. But an active, or rather a stupid, molecatcher having entered upon the duty, he soon performed his task so well, that, together with the moles, the green gairs, which had hitherto been proverbial, disappeared, and the place where they once were assumed a white bent appearance; and on such places it was that the sheep were attacked by their enemy the pining. For the last five years molecatching has been discontinued, and though the moles are still too scarce, yet in those places where they have again shown themselves, the soil is evidently ameliorated, and the pining is losing ground every year."

ON THE ECONOMY OF LABOUR BY THE GENERAL ADOPTION OF
TWO-HORSE PLOUGHS. *By Mr WILLIAM LAIDLAW,*
Kaeside.

IT must be evident to any one who has taken pains to compare the difference between a very good and a middling crop, or the more striking difference between the gardens and anciently cultivated lands of any old village, and the heathy moor of which they were originally a part, that the culture of the ground is the most slow and stationary of all the arts. The tardiness with which the spirit and methods of improvement in one district or country are adopted in another, is matter of frequent remark and just surprize; and, perhaps, we cannot have a better illustration of this fact, than by comparing the effect of the heavy teams and clumsy instruments of tillage still general in many parts of the kingdom, with the simple but efficient operation of the two-

horse plough. One would think that nothing could be more evident, than that a plough drawn by four horses, with a ploughman and driver, is never, for a moment, to be compared with a plough drawn by two horses and driven by the ploughman, in all the requisites of an agricultural machine; and yet it was necessary, that even more than a generation of men should pass away before the improved plough of Small could be brought into general use in Scotland, or before the Rotherham plough of Yorkshire could be extended beyond the narrow district in which it was at first employed. "In many parts of England," remarks a judicious observer, "four horses, and sometimes five, are employed to do the work of two; and, to the eye of a Scotch farmer, nothing can appear more ridiculous than this extraordinary misapplication and waste of so expensive a power. On the road between Glasgow and Edinburgh, a single horse draws from 1 ton to 22 cwt.; while four horses, equal, if not superior, in size, strength, and symmetry, are, in many counties of England (even where the land is extremely light), to be seen yoked to the plough one before the other. The writer of this essay has seen, in Worcestershire, five powerful horses, in the highest condition, yoked *at length* to a plough, in land so light that any one of them could have made as good a furrow as that effected by the whole five; and this in a field, or paddock, so small, that the first horse was turning at the head of the ridge, when the plough was but very little past the middle of the field *."

Within the memory of the passing race of farmers, there have been added to their machinery the fanners, the thrashing machine, the grubber, and Finlayson's harrow, which last, on light soils, may enable the farmer to dispense with nearly one pair of horses out of three, and with an equal chance that the crop will succeed. The general adoption of these useful machines would be attended with incalculable good. But I will, at present, confine myself to a consideration of the common two-horse plough, the universal adoption of which, throughout England, would, I assert, add more than three millions of quarters of wheat to the resources of the country: more, by far, than is needed by all the woollen manufactures of the three kingdoms

* Mr Fraser Tytler on the economy of feeding horses; Transactions of the Highland Society of Scotland, vol. v.

put together. But, to show this more distinctly, it will be necessary to enter a little into detail.

The return to the Tax-office, during the war, of the number of horses used in agriculture in England was 900,000. It was probably below the truth. There are only a few of the counties of England, which I need not here enumerate, in which the two-horse plough is generally adopted. Now, the number of horses in these counties, taken from a comparison of various documents, amounts to 137,696. We may consider all these as usefully employed, and indispensable. But every horse more than two in a plough, on the other hand, we are entitled to look upon as a public nuisance, and to deal with it accordingly. That all the ploughs used in England and Wales, excepting those counties to which I have alluded, are drawn by four horses, I by no means assert. The introduction of two-horse ploughs has, perhaps, been partial over nearly the whole kingdom; but it has been partial only; and in the greater number of districts four horses or more are yet employed in the teams. The whole statement, however, from the nature of the data, cannot have a claim to precision, but is merely intended as an approximation to the truth. But it may be assumed that, with the exception of those counties which are supposed to have adopted the two-horse plough, only every other plough is drawn by four horses, an admission that would suppose considerably more than one-half of England to have adopted the improvement we so much advocate, and which, unfortunately, is far from being the fact. But assuming that it is so, it follows, that of the number of horses employed in agriculture, which, after deducting the proportion just referred to, amounts to 762,304, there is employed one-third more than are necessary for the proper and most economical cultivation of the soil. Of course, 254,100 supernumerary and useless horses exist in England, usurping the place and consuming the food of man.

People accustomed to the use of two horses in a plough well know that they are fully adequate to the tillage of any soil—even of the heaviest sort, and are, besides, far more expeditious. This has long been well known; and it is confirmed by the practice of the whole island north of the Tweed, and some of the best cultivated counties of England. It is further strengthened

by the important improvements upon the two-horse plough since the time of Small, introduced by various mechanics in England, and by Wilkie and Finlayson in Scotland, whose iron ploughs, constructed upon good principles, work with nearly one-fourth less power than those, I may say, still in general use *. I may mention, that I have had three acres of turnip land drilled and covered in each day on loamy land, by two ploughs, and I have even known more done. And it is well known, that a pair of Northumberland or Yorkshire horses will plough in a day three-fourths of an acre of the strongest clay-land in England, 10 inches deep, and with great ease, whenever the land is in a state fit to be ploughed. In short, to doubt or call in question the efficiency of two horses, with a proper plough, for the work required, would be little better than asserting, that, although a single horse and cart might be able to bring a ton of coals into Glasgow or Edinburgh, yet that it could not be done on the streets of London; or that, although a steam-ship could navigate the Clyde, it could not navigate the Thames. Indeed, the fact of the above number of supernumerary horses being worse than useless, is beyond a doubt with all those who are best capable of judging.

Now, a pair of horses and a driver cannot be kept for less than L. 80 a-year, on the most moderate calculation. And 254,100 useless horses, or 127,050 pairs, with a driver for each pair, will cost yearly, L. 10,164,000!

Every thing, as we have proceeded, has been understated; and the data, although not so positive as could have been wished, are taken from good authorities. There is no room, therefore, for much doubt about the matter, however startling may be the result, and however great the enormity of the waste.

Let us now turn this consumption of grass, hay, corn, and horse-flesh, into food for man. I presume, it would be deemed a mere waste of paper, were I to go on and prove that horses consume the food of man; or that grass, hay, tares, beans, &c. could be turned, as they are every day, into butcher-meat. I

* Mr Finlayson's improvements on several instruments of tillage are valuable. Some of these are described in his work termed "The British Farmer and Ploughman's Guide," a second edition of which has recently been published by Mr Ridgway, London.

will make the conversion, by valuing a quarter of wheat at 65s. I shall consider the expense of the driver as wheat too. Taking, then, a quarter of wheat at 65s., the sum saved, being L. 10,164,000, is equivalent to 3,127,384 quarters; which, taking into account the proportion of children, would probably furnish a full supply of wheaten bread for 4,479,768 people*.

But this is not all. We ought in strictness to take into account what is consumed by these extra horses until they are ready for the yoke, at three or four years old. And here is another very great loss, the saving of which would fall to be added to the preceding amount, though quite wonderful enough already. This however, though it ought to have been added, I pass over for the present.

In one point of view, the foregoing statement of this extensive economy of labour may appear to some people not a little alarming. For it may have suggested itself, that if the counties that now labour their ground with two-horse ploughs, have come to pay the full rents that they are able to do, and if the rest of England were actually to follow their example, and three millions of quarters of wheat, or human food equivalent to that amount, were saved, which would, of course, come into the market instead of being applied to the support of the discarded horses, it would certainly bring upon them utter ruin; as it must have the same effect in lowering the price as if the same commodity were to be brought from Hamburg or Dantzic.

Now, there can be little doubt that 3,127,384 quarters of wheat thrown at once into the consumption, might be no trifling matter. For, were the universal use of two-horse-ploughs, and all the consequent retrenchments, to take place in the course of one or two seasons, and these seasons, at the same time, to be plentiful,—and the difference between a plentiful harvest

* How little could some of the neighbours of James Small have thought—for there is no saying what might have been the contemplations of the man of genius himself—when they, and many a shrewd enough old ploughman and farmer, sneered at him for his cutting and carving upon the good old plough of their forefathers (and a good old plough it was); how little could they think, when his first metal mouldboard was put to a trial, that he was beginning an alteration that would, in time, add some millions of souls to each generation of his fellow-countrymen!

and a deficient one is very great*—corn of all kinds would certainly become ruinously cheap. Although there seems to be some inherent and insurmountable deficiency about a corn law; somewhat like a clock set up without weight or spring, which will not go, but points the hour only as the hour passes: yet such a law may be made available, to a certain extent, to keep out foreign produce in times of great abundance at home. But in this revolution among the ploughs, no exertion of the wit of man could keep the maintenance of the defunct horses out of the market; and the amount of three months' consumption, added to the effect of two good harvests, would doubtless introduce a state of things, which the increase of no human population, black or white, could come up to. There would be an exhibition of the paradox of the plague of plenty, which farmers describe as the worst plague of all.

Most fortunate it is that matters are otherwise ordered: such forebodings are for the most part visionary. A generation of men at least, and three or four generations of horses, must intervene; and, in the mean time, population is really advancing its giant form, devouring, like the lean kine of Pharaoh, all before it. It is increasing just now at the fearful rate of about 200,000 a-year; and in thirty years, or less than one generation—for it seems that a generation has extended its limits—there would be added, supposing the same rate of increase to be continued, and taking into account the circumstance that the increase will act like compound interest, above eight millions and a half of souls to the present inhabitants of Great Britain. So that there is more to be done than the adoption of two-horse ploughs, and little to be feared from the plague of plenty.

* From queries put to a number of intelligent people, millers, victual-dealers, and farmers, in different counties in Scotland, it appears that the average of a very good crop of oats, the principal food of the people, is 36 bushels, or 6 Linlithgow bolls, per acre, 17 pecks of meal per boll, and about 30 men's meals per stone of 17½ lb. avoirdupois, measuring 2 pecks. The average of a very bad crop, like 1799, 1810, and 1817, is not more than 3 bolls per acre, 12 pecks of meal per boll, and 24 men's meals per stone. The result of which is

$$\left. \begin{array}{l} 6 \times 17 = 102 \times 15 = 1530 \\ 3 \times 12 = 36 \times 12 = 432 \end{array} \right\} \text{meals per acre.}$$

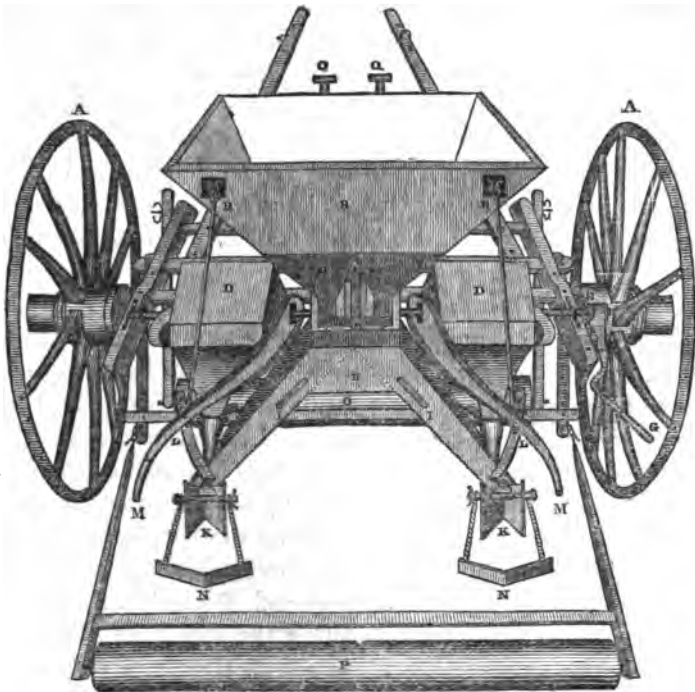
So that the number of meals per acre—for it comes to that at last—in the very good crop, exceeds those in the very bad and deficient one in the proportion of 10·6 to 3.

DESCRIPTION OF A MACHINE FOR SOWING TURNIPS WITH
BONE DUST.

BONE-DUST having been but lately introduced into Scotland as a manure for turnips, mechanics have not yet devoted much attention to the construction of machines for sowing it along with the turnip-seed. Their chief efforts have been directed to the affixing of certain apparatus for that purpose, to the turnip sowing machines already in use ; and, as may be expected, disappointment has often followed the use of such clumsy expedients. Machines for sowing turnip-seed have almost all been made to move upon rollers of small diameter. Such machines are very well adapted for sowing turnip-seed only ; but when the apparatus necessary for depositing bone-dust has been placed upon them, its weight has the effect of compressing the drills quite flat. To counteract this obvious defect, the diameter of the foremost roller has been increased by raising a rim in its middle, to sustain the weight of the machine ; and small wheels have been placed behind to support the weight that would otherwise be thrown upon its hinder part.

Even with this contrivance, one horse has great difficulty in drawing such a machine on any ground, and if acclivities intervene in a field, two horses must be used, which in a work of this nature is always inconvenient, even with the assistance of an additional man to guide the foremost horse. The small diameter of the roller imparts too great velocity to the pinion which supplies the bone-dust ; and, consequently, should any large piece of bone, which will sometimes escape the process of grinding, present itself, the whole machine is stopped, and the cause of the stoppage cannot be easily removed, without in the first place removing all the bone-dust out of the hopper. A spring, attached to the inside of the hopper, has been tried to propel the dust regularly through the bottom of the hopper ; but obstructions will occur in spite of it. The friction of the bone-dust on the sides of a wooden hopper will rub holes through it ; and in these bones will lodge, which it is beyond the power of the pinion or spring to remove, and which will either retard or stop the progress of the whole operation.

All these evils have been experienced by the writer of this article, and to so great a degree, that some years ago when he used such a machine as has been alluded to above, it took on one occasion, as a climax to his disappointments, two men and a horse *five* hours to sow two acres of turnips. Since then, he has been endeavouring to construct a machine, which would obviate all these difficulties. Success has at last crowned these endeavours. He has now used his new machine for two years in its completed state, over a considerable extent of ground; and he can state that he could wish no machine to perform more perfect work, or do it with greater celerity. One horse can draw it with ease on any acclivity of ground; and in one day it has sown 190 bushels of bone-dust.



This machine is set upon two wheels AA, made lightly but firmly of oak spokes and iron rims, 3 feet 8 inches in diameter, and embracing two drills of 4 feet 4 inches in breadth. The hopper

B is 30 inches square at the top, and contains about 4 bushels of bone-dust. The bottom of the hopper CC is made of cast metal, which will last for a number of years, and which permits the supply of dust by the pinion to be emitted with great precision. The pinions at the bottom of the hopper, 6 inches in diameter, instead of being made like a ratchet-wheel, have eight long straight teeth, which scoop out the dust with much greater certainty than any ratchet-wheel and spring can do. The seed boxes DD are on the same axle as the long pinions, and the whole are driven by a pinion 6 inches in diameter, with 16 teeth fastened on the inside of the nave of the wheel A. This pinion works on another of the same size E, which in its turn moves the seed axle pinion, 4 inches in diameter with 10 teeth, and which is thrown off the catch by the bayonet G. The wheel A passing over a space of $11\frac{1}{2}$ feet in each revolution, and the small pinion making $1\frac{1}{4}$ revolution in the same time, their motion will be so slow, and of course their power so increased, as that the hopper pinions will be able to break any large piece of bone that cannot easily pass through the opening at the bottom of the hopper; or should even the wheel be stopped by any great obstruction, such as a stone, the man, by using the wheel as a lever, and turning it smartly round, will make the obstruction give way instantly. The bone spouts H are joined together, and may be made of wood, tin, or plate iron. The holes II are made in them to permit the man to see whether the dust is descending. The coulter KK are fastened to the frame-work of the seed boxes DD, and their depth in the soil is regulated by lowering or elevating the iron stays LL, which are fastened to the handles MM, by which the man lays hold of the machine. The drags NN are useful in filling up the ruts over the seed, made by the coulters, especially in damp weather, and by which the singling of the turnip plants is afterwards much facilitated. Both the fore and hind rollers O and P can be removed at pleasure. The plates for regulating the supply of dust are moved by the screws QQ. These screws are placed outside of the hopper to be out of the way. RR two iron stays on one side, and one on the other side are necessary to keep the hopper steady. One bushel of bone-dust will sow 209 yards, along two drills, at the rate of 16 bushels per imperial acre. The hop-

per B, the bone spouts H, and the drags NN, can all be easily removed, when the machine is then fit to sow turnip-seed on the land that has been manured with dung. When these are all removed, the seed-boxes, handles and coulters being all moveable round the seed axle, the machine is well adapted for the sowing of turnips on newly taken in rough land, in elevated situations, or on land in which are numbers of land-fast stones, which would inevitably break the machine, were these parts to remain immovable, as is the usual construction of such machines. S.

HINTS ON THE MOST ECONOMICAL MANNER OF FEEDING

HORSES.

To economize the food of working animals, must be admitted to be an object of great public and private importance. The practices of different parts of the country are not all alike perfect in this respect. In Scotland, which is behind no country in general agricultural improvement, there is yet much to be learned in this branch of rural economy. In the general management and economical methods of feeding horses, Scotland, generally speaking, is greatly behind England; but in England itself, the most approved practices are not always generally known, or universally adopted.

A great variety of articles, as every one knows, are employed in the feeding of horses; of grains, there are oats, oatmeal, barley, bran; of leguminous plants, there are beans and pease; of roots, there are the potato, the turnip, the carrot, and the parsnip; of dried grasses and other plants, there are hay, saintfoin, clover, ryegrass, and straw; and, occasionally, other substances, as oil-cake.

In North Wales, where a scarcity of hay is often much felt during winter and the early part of spring, the gorse, or furze, is frequently employed to feed both horses and cattle. It is prepared for that purpose by being bruised by small water-mills, and, when mixed with a proportion of oats, or chopped or cut hay, it is found to be a strong and nourishing food for the horse. This plant is also similarly used in several districts of the county of Devon. And, in Scotland, where the furze or

horse abounds in many places, such a practice might be adopted with great advantage.

Of the different kinds of grain given to horses, the oat is found to be the best adapted to support the strength and spirit of the animal. Amongst roots, the carrot and the parsnip are much valued; but these, although they contain more saccharine matter than the potato, and although probably equally nutritious, yet, as they require greater nicety in their cultivation, and a richer and deeper soil, they cannot be so universally and cheaply raised, and in such large quantities, as the potato. The latter, growing in almost every soil of this island, may be said to be the most useful of all this class of plants, for the feeding of the horse.

In feeding with potatoes, however, one precaution should never be neglected, which is to steam or boil them before using them. The giving the potato in its raw state to the horse, has been fatal to numbers of these valuable animals, especially when on hard work, and overheated by violent exertion. In its crude state, the potato is exceedingly apt to ferment in the stomach of the horse.

In the feeding of the horse with grain, whatever be the kind given, it should always be bruised; or, what is better still, coarsely ground. The hay, too, ought to be cut into small lengths, not exceeding half an inch, nor less than a quarter of an inch; and a quantity of straw, cut in like manner, should be mixed with it. For the purpose of bruising the grain, and cutting the hay and straw, simple machines have been invented, which can be obtained at no very considerable cost. In Scotland, where thrashing-machines are universally employed, it is recommended that the machinery, for the purposes referred to, should be attached and moved by the same power.

When the grain has been bruised, and the hay and straw cut, it will be necessary to proportion the quantity of each to be mixed together, and to make up a sufficiency of food on which a working horse may subsist for twenty-four hours. And, in order to illustrate this, we cannot do better than mention a few examples taken from the practice of stables, where this mode has been long and successfully followed.

In the stables of Messrs Hanbury and Trueman, in Spittal-

fields, where 82 horses are kept, the animals receive all their food in the manger, no hay being ever put into the rack. The stable, which is spacious enough to contain this number of horses, is one of the most perfect in all its arrangements in London, and, being admirably well ventilated, disease rarely occurs.

The excellent health, condition, and general appearance of these horses, evince the goodness of the treatment adopted. They are fed in the following manner. Each horse receives in the twenty-four hours 18 lb. of cut hay and straw, the proportion of the latter being one-eighth; 14 lb. of bruised oats, and 1 lb. of bruised beans; making in all 33 lb. of food. In summer no beans are given, as they are then found to be too heating; but, in consequence of the beans being withdrawn, a small addition is made to the quantity of oats. Half a pound of salt is given weekly to each horse. This being divided into two portions, one of them is given on Saturday night, the other on Sunday, and being so administered, the salt gently purges the animal. And on account of this effect, and as the animals receive no boiled or steamed food, it is thought better, by Mr Hanbury, to supply the salt in this manner, than to deal it out nightly in smaller quantity.

In another stable in Long Lane in London, belonging to Mr Higgins, where above 300 heavy cart-horses are kept doing much daily hard labour, no hay is ever put into the rack. It is always mixed with straw, and cut down into lengths not less than $\frac{1}{4}$ th of an inch. The hay used is generally clover hay, with one-half of barley straw. The oats, barley, and beans, are always coarsely ground before being added to the cut hay. Although the quantity of hay, being 19 lb. for a very large horse, and 14 lb. for a very small one, given in the 24 hours, remains unaltered throughout the year, it is found advisable during the same period to alter the kinds and quantities of grain. In winter, a larger proportion of beans is given than of oats, the quantity being two-thirds of the former and one-third of the latter. As the spring sets in, the allowance of beans is gradually diminished to one-third, the other two-thirds being made up of barley, which grain is held to be more cooling for spring food. But in summer oats are substituted for barley. Of the mixture of these

bruised or ground grains the large elephant-size cart-horse receives 20 lb., the smaller animals 16 lb. ; and, with the addition of 3 lb. of bran during winter, and 4 lb. during the rest of the year, every large horse thus receives in the 24 hours about 40 lb. of mixed provender, and every smaller horse about 33 lb. Salt is not given during winter, but always in the other quarters of the year ; an ounce being then daily mixed up with the other ingredients of the food.

In this last stable, as well as in all others, where the same system of feeding is practised, the following method of mixing up the materials of the food is observed. The cut hay is first laid on the floor of the barn or loft, over it the bran, next the bruised or ground beans, and lastly the other ground grain. All the substances are then tossed together, and, thus prepared, the provender is ready for use.

Although we have thus detailed the method of feeding cart-horses in some of the best managed stables of London, we are more inclined to direct attention to the plan followed by Dr Sully of Wiveliscombe, in Somersetshire *. This gentleman has, for more than 20 years, successfully pursued the plan of feeding which we are about to detail. Its utility and economy are apparent, and we feel confident that it may be generally practised with advantage.

Dr Sully says, that his horses employed in his professional practice, and accustomed to travel at the rate of eight miles an hour, "from the great labour they undergo, have no sinecure place, and yet few people can boast of cattle being in better condition." In his stable there are no racks to hold the hay. He objects, and we think with the greatest reason, to the employing them. In the first place, the groom, if the stables are fitted up with racks, will always fill them, and by so doing tempt the horse to eat too much, thus overloading his stomach ; so that when, in this full distended state, he is taken out of the stable and put to work, his wind will be endangered. And not only does the full hay-rack often occasion this injury to the horse, but it is the

* See an interesting Letter of his in the *Sporting Magazine* for November 1826.

cause of great unnecessary waste of provender. It must have frequently been remarked by those who have entered a stable, that all horses, when they have the command of their head, pull the hay out of the rack and throw it under their feet. This is purposely done, that the more tasty portions of the hay may be selected for food, and the rest rejected. Few, if any, grooms will replace in the rack the hay that has been thus refused; and a great waste of it necessarily ensues. It is Dr Sully's opinion, that a horse with a well filled rack will consume and spoil upwards of 30 lb. of hay in 24 hours. But when it is cut down and mixed with a due proportion of cut straw and bruised or coarsely ground oats, or other grain, 10 lb. are sufficient.

The details of Dr Sully's manner of feeding his horses are worthy of imitation, combining, we conceive, convenience and economy of time and labour. In the loft above the stables, are prepared the proportionable quantities of the food with which his horses are daily supplied, and a very simple method has been devised to convey it when mixed into the manger of each horse. A wooden pipe is made to pass from the loft into each of the mangers, and close by the mouth of the pipe in the loft is placed a tub of size enough to contain what is sufficient food for a horse for 24 hours. To prevent the horse, in searching for the grain, from tossing out of the manger the mixed food which is dropt into it, oaken cross-bars, 12 inches distant, are nailed over it. Between these bars ample space remains for the horse to feed.

As there can be no dependence on the measured quantities of grain or other food given to the horse, from the variation at times in the respective weights of equal quantities, Dr Sully recommends, and indeed regards it as necessary, that grain of all kinds, and also the cut hay and straw, should be carefully weighed. When all the ingredients are so prepared, the proportions for each horse are allotted. From the table which follows will be seen the different articles of food, and the quantities and weight which the horses should receive.

	1st Class.	2d Class.	3d Class.	4th Class.
1. Farinaceous substances, consisting of bruised or ground Beans, Pease, Wheat, Barley, or Oats,	lb. 5	lb. 5	lb. 10	lb. 5
2. Bran, fine or coarse, . . . . .	... ..	... ..	... ..	7
3. Boiled or steamed Potatoes, mashed in a tub with a wooden bruiser,	5	5	... ..	... ..
4. Fresh grains (boiled Barley),	6	... ..	... ..	... ..
5. Hay cut down into chaff,	7	8	10	8
6. Straw cut down into chaff,	7	10	10	8
7. Malt Dust, or ground Oil-cake, . . . . .	... ..	2	... ..	2
With 2 ounces of salt for each class.	30	30	30	30

By this table it will be seen that each horse receives 30 lb. of food in the 24 hours, a quantity which will, in all cases, be found to be amply sufficient. The addition of 2 ounces of salt is necessary to assist the digestion of the food. All herbivorous animals, as is well known, in their wild state, indicate the necessity or utility of this condiment, by resorting wherever it is to be met with in those places where native salt exists. In the vast forests of America, where rock-salt abounds, those spots are called by the natives Salt-licks, from the wild cattle resorting to them to lick the salt. In Cheshire, and the salt district of that county, there is a farm which is noted for the excellence of its cheese. On this farm is a natural salt spring to which the cows daily resort, and by many it is believed that the tasting of this brine by the cows adds to the flavour of their milk *.

Of the four classes into which Dr Sully divides his ingredients for feeding, those two which contain the steamed or boiled potato are the most recommended. No food conduces more to the healthy working condition of horses than the steamed or boiled potato; and we may observe, with relation to this, as well as to other kinds of food, that when the horse comes in weary and hungry, after a long day's work, it is necessary to fill his manger more copiously with the ingredients prepared for him.

* In the last Number of this Journal, the value and uses of this important condiment are fully treated of.

In determining what kind of food shall be given to the horse, and in what quantity it shall be supplied, particular circumstances must often be allowed to operate. Violent and long-continued exertion, for example, will require the strongest food, and the largest allowance of it. It will be apparent, however, in the several instances before adduced of the most approved methods of feeding horses, that although these methods may differ in the kinds of articles selected for food, and in the quantities of the mixture given, they all agree in certain essential points; and it is to these that we wish, in an especial manner, to direct the public attention. The methods, it will be seen, all agree in the practice of invariably bruising or coarsely grinding the grain and beans, in cutting down the hay and straw, in giving no hay in the rack, in allowing salt, and in weighing each article separately, before mixture, in place of adopting the fallacious guide of measurement.

Having thus very imperfectly endeavoured to point out what is conceived to be the best method of feeding horses, it is unnecessary to dwell on the various advantages which such a system offers.

As the horse advances in age, his teeth gradually lose their perpendicular position, and become less fitted for grinding the hard food which the nature of his work, and his artificial situation in stables, renders it necessary for him to receive. His mastication is rendered imperfect, and the grain, when given him unbruised or unground, is often swallowed entire. And as the saliva and the gastric juice of the stomach are held to be the solvents of the food, and as more perfect mastication must allow these to act with more effect upon it, a more perfect digestion, we may believe, is induced by giving the grain in the bruised or ground state, and by the cutting down of the hay and straw. Thus, not only must the practice be conducive to the health of the horse, but it must produce a great saving of the food. To persons requiring constant and steady work from their horses, the advantages of the practice are very obvious.

The carrier, with his horse-provender weighed, mixed, put into a bag, and carried with him, can feed and refresh his horse at all times and places. The same observation applies to the farmer, and more strongly still to the post-master, whose horses

have sudden calls upon them for great exertion. By means of provender so prepared, his horses soon fill themselves, and thus have time to lie down, sleep, and rest. To the gentleman and sportsman such a plan of feeding has also many advantages. The health of his horse is promoted, and the economy of its provender assured. The following are the words of the intelligent, humane, and experienced gentleman whom we have already quoted. "My business," says Dr Sully, "extends through Somerset, Devon, Cornwall, Dorset, and Wilts. I travel with single horses on one pair of wheels, and, by relaying, I am enabled then to cover more ground with four horses than any man I know in England, besides my pace is seven and eight miles an hour, and my servant, who always accompanies me, generally puts in a bag of provender of coarsely ground grain, and cut hay and straw. I am certain the same plan will equally succeed with horses, coach or saddle."

Although we pride ourselves in Great Britain, and very justly, on the beauty and excellence of our horses, yet how superior soever we may be in this respect to our continental neighbours, we do not surpass them in knowledge of stable-management. Those who have visited that portion of Switzerland which borders on Germany, must have witnessed the skilful manner of feeding horses. No grain is given to these animals without its due proportion of cut hay and straw. The hay-cutting machine is in very general use in this quarter of that delightful, romantic, and industrious country; and it is not only employed for the horse, but also for the cow. During winter, along with different kinds of roots, as the carrot, the turnip, the parsnip, chopped up, a quantity of cut hay is mixed for the cow. If we pass from Switzerland into Germany, we observe the same, and perhaps greater, attention to the food of the horse. To all the grain he receives, a portion of cut hay and straw is always added, and, it may be remarked, that it is not uncommon, while on a journey, for the Swiss and German horseman to feed his steed, with coarse brown bread, half-a-pound or more at a feed*.

* It may be observed, that this latter practice is also common with millers in some parts of this country.

But it is unnecessary to go out of our own island for examples of good and economical modes of feeding horses; to the instances we have quoted, of the manner of treating them in certain stables in London, many more might be added; and if we travel the roads leading to the south from that great city, we shall find innumerable examples of the same good management.

S. M.

ON TRIFOLIUM INCARNATUM, OR CRIMSON CLOVER.

THIS species of clover is a native of France, Switzerland, and Italy. It is cultivated to a considerable extent in the southern provinces of France; it is an annual plant, and is very productive. The characters of this plant in a cultivated state are the following:—Stem stout, branched, striated, covered with short spreading hairs, which become ascending on the elongated peduncle. Leaves on long downy stalks; leaflets wedge-shaped, nearly abrupt, or broadly obtuse, crenate, hairy on both sides; stipules broad, obtuse, membranous, beautifully veined with green, and covered with longish down on the back. Spikes oblong, obtuse, about two inches long. Calyx a little compressed, ten-ribbed, covered with longish white hairs, and having the tapering bristle-pointed segments of nearly equal length. Corolla about twice the length of the calyx, monopetalous, deep red. Capsule, included within the tube of the calyx, containing a single oval, compressed, glossy, yellowish-brown seed.

This species differs from the common red clover (*Trifolium pratense*), in having more elongated spikes and peduncles, in the different form of the stipules and leaflets, and in the greater hairiness of the calyx. The latter species has two nearly opposite leaves close upon the globular spike, while the crimson clover has the uppermost leaf several inches distant from the spike, which is oblong. The stipules of the common clover taper at the point into a long awn, and its stems are smooth in the lower part. And, moreover, the plants of the crimson clover which we have seen, are much stouter than those of the common red clover.

In the Bordelais, in France, where this plant is cultivated, it

780 *On Trifolium Incarnatum, or Crimson Clover.*

is sown in the end of August, or beginning of September. It is ready for the scythe in the beginning of May following, and is succeeded in the same year by a crop of potatoes or Spanish wheat.

Sir John Sinclair, in a communication to the Farmer's Journal in August 1821, states, that the Professor of Agriculture and Botany in the University of Modena strongly recommends this plant as the earliest of trefoils; as the most useful for increasing forage; as particularly calculated for dry soils; and as preferring the mountain to the plain. It is so hardy, that it stands well the severest frost of these countries. Some experiments, continues Sir John, have been tried with this plant in Berwickshire, which in a great measure justify what has been urged in its favour.

This plant was cultivated to a small extent last year, by some farmers in the neighbourhood of Edinburgh. They sowed it in spring, along with their crop of barley. The plant is annual, but they had expected it to be a biennial or a perennial, and had used it as a substitute for red clover. It sprang up amongst their crop, flowered in June, arrived at maturity, and was cut down along with the grain. It did not, therefore, succeed in the subsequent year; and thus the trials were too precipitately regarded as a failure.

This plant, as has been already proved, is perfectly suited to the climate of Britain; and it certainly deserves a further trial than has yet been made, to allow it to be compared with our cultivated clovers. The proper season for sowing it, in the places where it is cultivated on the Continent, is found to be in autumn. When first introduced from the Bordelais into Normandy, where it is now grown with success, it was sown in the common manner in spring; but this was soon found to be an erroneous practice, the crop scarcely, if ever, succeeding, unless sown previous to the months of winter. Should any of our agriculturists at home, therefore, be induced to make experiments on the cultivation of this very beautiful species of clover, they should keep in mind that the plant is an annual one, and that it must be sown in autumn, in order to reach its proper maturity in the following summer.

ON THE USES OF THE WHIN, FURZE, OR GORSE.

MUCH care is bestowed on exotic plants, when first brought to our gardens. Every little property of usefulness, real or apparent, which they may exhibit, excites attention. But many of our indigenous plants, possessing equally beneficial properties, are overlooked and neglected. Being already familiar to our soil, and inured to the vicissitudes of our climate, they require no particular care. Thus many of their properties have never been fully investigated, while others are passed over unnoticed altogether. The fern, the briar, the bramble, the cranberry, the sloe, the far-extended heath, and many others, invite our attention. Nor is the whin the least deserving of notice amongst our indigenous plants.

The whin is of the genus *Ulex* ; it belongs to the natural order Leguminosæ of Jussieu ; and ranks in the class Diadelphia, and order Decandria, of the artificial or sexual system of Linnæus. Hence it is in that order which composes the family of plants having papilionaceous or butterfly-shaped flowers, and leguminous seed-vessels. The Linnean system brings under their respective classes and orders plants having the parts of fructification alike. The genus *Ulex*, therefore, stands in the same class and order with the following pretty well known genera, of which the names of a few of the most important species are given. *Ononis*, the Rest-harrow ; *Genista*, the petty Whin, and the Broom (the generic name of the latter was formerly *Spartium*) ; *Anthyllis*, the Kidney-vetch ; *Pisum*, the Pea ; *Orobus*, the Bitter-vetch ; *Lathyrus*, the Vetchling and Everlasting-pea ; *Vicia*, the Vetch or Tare, and Bean ; *Astragalus*, the Milk-vetch ; *Trifolium*, the Melilot, Trefoil, and Clover ; *Lotus*, the Bird's-foot Trefoil ; *Medicago*, the Medick, and Lucern ; *Hedysarum*, the Saint-foin ; and *Ervum*, the Lentil, so much prized for being of the greatest antiquity of all the leguminous plants, as the earliest of the sacred writings bear record.

The whin is so familiar to every one, that a description of its generic and specific botanical characters here would be superfluous. There are three European species ; *Ulex europæus*, the

Common Furze, Gorse, or Whin; *Ulex nanus*, the Dwarf Furze, and *Ulex strictus*, the Upright Irish Furze. All the species are evergreen shrubs. The *Ulex nanus* has by some been considered only a variety of the *Ulex europæus*, though, by the greater number of botanists, it is held to be a distinct species. It grows on dry elevated heaths and pastures, and flowers in autumn; while the *Ulex europæus* flowers generally in spring, or the beginning of summer, though occasionally at all seasons. In the *Ulex nanus* the branches are reclining, while in *Ulex europæus* they are upright; and the former is only half the size of the latter in all its parts. The *Ulex strictus*, or Upright Irish whin, has also been regarded as a variety of *Ulex europæus*, but it is at least as distinct as the dwarf furze. It produces a great number of shoots from one stem, and possesses much luxuriance; while its thorns are feeble, and its shoots succulent and soft. Hence of all others it may be supposed, from these properties, to be best adapted for food for domestic animals.

There are several varieties of *Ulex europæus*; but of these, one is particularly deserving of notice. It is *Ulex europæus flore pleno*, or Double-flowering whin. This, from the beauty of its double flowers, is held in estimation as an ornamental shrub; but, as double-flowering plants do not produce seed, and can only be increased by layers or cuttings, this variety is too expensive for being otherwise employed than in the garden or shrubbery.

The common whin, like the heath and the pine, is a social plant, growing in masses, and covering considerable tracts of ground, to the exclusion of feebler plants. Where the soil is unfavourable to the growth of such plants as are natural to a district, and where the particular kind of social plant possesses a degree of superior luxuriance of growth, the latter gains an ascendancy, and usurps the place of its feebler associates.

The whin is found naturally only in the temperate and warmer parts of Europe. It occurs in Britain, Portugal, France, Brabant, some parts of Germany, and in Denmark. It is more abundant in the western parts of France and Portugal than any other country, except Britain. Intense cold and severe frosts are injurious to the plant, by which, even in Britain, it is sometimes destroyed to the ground. Where the bushes are large and old, the smaller branches near the ground decay and

leave the roots exposed to the frost ; but where they are regularly pruned, or kept in dense bushes, they are not injured by the frost *.

The natural locality of the whin is a dry, light, sandy, gravelly, moory, or rocky soil. It is not found on strong wet clays or soft moss. Though found in masses, and covering considerable tracts of land, the whin has also its favourite situations. It is frequently found on the skirts of moors, where it cements the dreary sameness of the heathy landscape with the enclosed field. It is also found growing on the mounds formed by excavations, and the refuse of quarries, and the like ; and it grows on the little gravelly or sandy eminences and rocky coasts, even within the spray of the ocean. Indeed it seems to stand the influence of the humid atmosphere in a littoral district, where most plants, not maritime, exhibit a shyness of growth, better perhaps than any other shrub. But it is seen to most advantage on the rocky cliffs, the banks, and along the little gravelly eminences of streams and rivers.

The whin is classed amongst the middle rank of shrubs, though it sometimes attains to a considerable size. Mr Billington relates that, at Chopwell, in the county of Durham, some of the stems measured nearly 8 inches in diameter, or 28 inches in circumference ; and that some of the whin bushes, which were all from one original root, and nearly of a circular form, measured nine yards in diameter. In certain places, too, the whins were from 8 to 9 feet in height.

On some of our mountains, the whin performs a very useful purpose in the economy of nature. On the mountains of North Wales this has been particularly remarked, where the soil seems to have been formed by the accumulation of the annual decay of portions of the furze. On the naked rock, lichens and mosses are the first plants which can receive sufficient nourishment to vegetate. These, by their annual decay and renewal, afford

* " In the severe winter of 1779-80," remarks the Reverend Mr Findlater, " when the violence of the frost destroyed most of the whins, I perfectly recollect that the whin bushes upon the north end of the Pentland Hills, near Edinburgh, which survived the frost, were the low matted bushes which had been cropped over, both sides and top, by the sheep. The sheep may thus instruct us in the proper management of the whin, as the ass did the ancients in the management of the vine."—*Findlater's Agriculture of the County of Peebles.*

soil for the heath ; and it again, through a succession of ages, is supplanted by the furze. And this last, by the decay of parts of its branches, and from the closeness of the bush retaining the debris of the higher rocks, rapidly accumulates, in conjunction with the fern, a body of soil sufficient for the growth of corn.

Many plants possess peculiar properties by which their seeds are disseminated, and in the whin this property is particularly remarkable. It is a low dense bush, generally spreading close upon the ground, and without high flower-stalks to elevate the seed. Now, were the seeds simply to fall out of the legume, they would drop among the branches, or within the space covered by the mother plant, and thus would never be able to vegetate. But nature produces no such waste in her productions ; and the whin possesses a very singular property, by which its seeds may be disseminated. The little elastic pods which envelope the seeds, when ripe, on a warm sunny day, explode with great force, by which the latter are thrown to a considerable distance. This fact is familiar to every shepherd-boy, though he may not be able to trace all the effects to their causes in their true philosophical spirit. And this shows to us that astonishing diversity of means, all so admirably suited to their end, which has been employed in nature for accomplishing her purposes. Those who may not have observed this peculiarity in the manner in which the seeds are ejected, may gratify their curiosity in a very simple manner. Let a twig of a whin-bush containing ripe seeds be procured ; if it be held near a fire for the space of eight or ten minutes, and afterwards taken away, the pods will explode, and the seeds be ejected with a degree of force little to be conceived from such an object.

If we compare the whin with the different plants which compose the food of our domestic animals, it will be found to have the aspect of a shrub rather of too woody a nature to become useful as food. But we are often too apt to look at the plant in an improper state ; we see it in its natural state when uncropped, where it pushes out few additional fresh shoots, but expends its strength in producing seed, and increasing the magnitude of the woody stems. And these have frequently assumed a degree of hardness and solidity little analogous to the general food of our graminivorous animals. If we examine the shoots

of young plants, however, a very marked difference will be seen. They will be found to be juicy, tender, and the thorns with which they are armed soft and almost harmless.

Even the most casual observer cannot but have noticed that the whin-bushes, in many natural pastures, and in large commons and moors, present a beautiful conical appearance, many of which surpass in their uniformity and exactness the artificial pruning of the gardener's shears. Such bushes, too, present a great appearance of freshness and vigorous growth; thus showing, that sheep, cattle and other animals browse upon the whin, and regularly nip off the young and tender shoots; and also showing that such treatment is not injurious, but is useful for promoting the more luxuriant growth of the plant.

Evelyn, Duhamel, and other eminent writers, have recommended the whin for fodder to cattle in winter. Goats, sheep, deer, cattle and horses, feed upon the tender tops of it, or eat it when prepared by being bruised. Dr Anderson has recommended the whin to the particular attention of the farmer. When properly bruised, he says, cattle are very fond of it, and increase in fatness as fast as on turnips. Cows yield as much milk as when fed on grass, without any bad taste, and the butter made on such food is very superior. Horses are also very fond of it; and, though some persons imagine that with it they might do without grain, Dr Anderson seems to think that it has more the effect of fattening horses, than of fitting them for hard labour. Mr Eddison of Gateford says, that horses prefer whins to hay, or even to corn. He calculates that a single acre well cropped with whins, will winter six horses. The whole crop should be taken at three or four years' growth, cut over by the ground, bruised in a mill, and then given to the horses. For this number of horses, four acres ought to be kept in whins, that one may be used in each year at the age proper for being cut. Mr Eddison reckons the labour of one man sufficient for providing food for these horses*.

The Duke of Richmond communicated to the *Annals of Agriculture*, an account of feeding his deer, sheep, and horses on whins, in the years 1802 and 1803. The quantity of whins required was cut fresh every day in the field, and bound up in small bavins. In this state they were carried to the mill, where

* *Encyc. Britann. v. Agriculture.*

they were unbound, and boys with hand-bills cut off the green branches. The dry stems were again bound up, and sent to be used at the brick-kilns. The diminution of them in number by the process of cutting off the green branches, was about thirty-five in one hundred; but they were then better for the kiln, the dry stems giving a stronger heat, from having more wood and less leaf on them.

The green branches of the whins, cut off by the hand-bills, were passed through one of the machines for chopping straw and chaff, which was worked by the mill; this cut the whins tolerably small, but not sufficiently so for cattle to eat them pleasantly, as there were in that state several of the prickly parts remaining. The whins so cut were then put into a strong wooden trough, which, by means of the mill, was moved gently backwards and forwards; and into this trough there fall in succession seven beaters, or pounders, made of wood; in the bottom of each were fixed four cutting knives. A man attends to stir up the whins, and to hook up the pounders, when he removes what is sufficiently cut, and puts more in its place. The whins then cut and ready for use, are put in sacks, and carried to the cattle. They should be cut and used fresh every day, otherwise they are apt to heat and become sour.

The expense, including every thing (except erecting the mill), amounted to L. 2 : 3 : 8 per ton, which, as the bushel weighs 17 lb., is 4d. per bushel. When given to horses, it was computed that three bushels are equivalent to one bushel of oats. The whins were given mixed with oats, chopped hay, and straw.

When given to the deer, the whins were spread where the grass was shortest, in a long row, to enable the whole herd to come to them separately, and to avoid their poking each other with their horns, which they are apt to do, if fed too closely together. They seemed very fond of the whins, and eat them very clean up in dry cold weather. The deer in general seemed to thrive upon this food. About the end of April they left off feeding on the whins, chiefly owing, perhaps, to the new grass coming; but the whins, from the bloom then appearing, also have a very strong smell, which might be unpleasant to the animals.

Of the sheep, 20 widders were put into a place where there was no grass, and fed upon whins for two months. During the first month they had a little hay given them, but none during the last month. They were four-year-old widders, and having been weighed when put up to feed on whins, and when the feeding was left off, they were found to have gained 29 lb. weight among the 20, which is nearly upon an average $1\frac{1}{2}$ lb. on each sheep. During the last month, the 20 widders consumed $4\frac{1}{2}$ bushels of whins per day, being about $3\frac{1}{2}$ lb. per sheep: and this, according to the above computation of £2: 3: 8 per ton, being the cost of the whins, makes the expense something more than $\frac{1}{2}$ d. for each sheep.

Mr Fraser Tytler drew up an account of certain experiments made during the years 1812, 1813, 1814, and 1815, on the economy of feeding horses, which was published in the 5th Vol. of the Transactions of the Highland Society. One of the chief kinds of food which he used for his horses was whins. Mr Tytler, on commencing the feeding of his horses with this plant, was not at all sanguine in the project. He had heard of the practice, but rather as the experiments of theoretical farmers than as a matter of real practice. He had abundance of materials supplied from the waste ground of his own farm, and his first experiments were made on a small scale, to avoid ridicule in case the scheme should prove abortive. He first tried whether the horses would eat such food. Having collected and bruised a small quantity of the young succulent shoots, these were put into the manger of two stalls before his horses came in from their morning yoke: when they came in, without touching their hay, both horses completely finished their new mess before they ever lifted their heads to the hay-rack. A larger quantity was given the following day (weighing from 2 to 3 lb.) to each of eight work-horses, and it was devoured by each with such avidity as to show that such food was very acceptable to them. He next tried them with oats and whins: the whins were put in one end of the manger, and the oats in the other. The horses, he says, preferred the oats, but showed that they had some difficulty in making the choice, occasionally snuffing at and taking a mouthful of the whins while they were eating their corn; and the corn was no sooner finished than

began with the same avidity as they did the day before, and ate up the whole whins that were before them. Bruised whins were also given to the cattle, which ate them greedily, but only in small quantity, being that which was left of the regular provision for the horses, and no experiment was made on them.

Mr Tytler also states, that the forage used by the regimental horses of the British army under the Duke of Wellington, while in the north of Spain and in the Pyrenees, was chiefly whins, on which they were found to thrive remarkably well. In a letter to Mr Tytler from Lieutenant-Colonel Macgregor, and one from a friend of the Colonel's, who was with the army at the time, the method of feeding them is described. The whole of the regimental horses and mules of the division were fed on whins ; they were mostly given to them at night when doing them up, and the quantity given was as much as they could eat during the night. They occasionally got a small allowance of corn, and were turned out to browse the whole of the day when not wanted ; but what they then picked up could not have affected them much in point of nourishment, it being then winter, and numbers feeding on the same spot for a length of time. The period during which whins constituted the principal part of the food of these animals was from October till March. . During a great part of the time of feeding them in this way, they had but little work to do, and they improved in condition, having fallen off much before by their great fatigues and privations ; and on the army advancing to Bayonne, the animals did their work well.

At the time of the year when the forage is scarce on the frontiers both of France and Spain, continues the writer of the last-mentioned letter, the natives feed their horses and mules on whins ; and in every house a trough with a heavy mallet is found for preparing them. It is the green shoots of the whin that is cut, perhaps about a foot in length or more, and placed in this trough (which is generally the bottom of a tree scooped out, and of a very hard substance), and then beaten with the mallet until it is completely mashed. It is then so much comminuted that it may be rubbed in the hand like bran, the prickly heads being quite pounded away. It is a very laborious employment, he observes, which the grooms belonging to the army were heartily sick of. He also states, that almost every horse of the regiment was afflicted with worms or botts ; but this seems to have

been attributable to their former bad food and privations, and not to their having been fed upon whins, as Mr Tytler informs us, that, during the whole of the five years which he had then fed his horses on whins, he had not had a single sick one in his stable.

Mr Tytler's mode of procuring and preparing the whins was both a simple and a cheap one. The whole of his establishment for providing whins for twelve horses, consisted of a female, a boy, a small cart, a mule, and a whin-mill. The female was furnished with a pair of hedge gloves, a sheepskin apron, an old reaping-hook, and a short-forked stick, with which to hold the whins while she cut them with the hook. The manner in which the whins were cut was as follows. The female, laying hold of the branch with the forked stick, with a cut of the hook drawn towards her, trimmed off such a part only of the ligneous substance of the plant as connected three or four or more of the succulent shoots of the year's growth. By the joint use of the hook and fork, these were laid into bundles or faggots, and compressed, as they were formed, by a stroke of the foot. The woman soon became very expert at the work, and cut, in the course of six or seven hours, the whole quantity of whins then given to twelve horses. The cart then came round for the faggots, collecting the cutting of each morning and the preceding evening, which was forked in with a common pitchfork, pressed down by the boy's feet (who was furnished with a pair of coarse leather gaiters to defend his legs), roped down like a load of hay, carted home, and deposited at the bruising-mill. This was the morning work,—the business of the afternoon was to bruise them.

The bruising-mill was of a very simple construction. A circular course, of about 8 feet in diameter, was paved with coarse flags; an upright post, about 2 feet in height, was fixed in the centre of the course, in the top of which was a pin which was attached to a spindle or horizontal axle by a swivel working on this pin. The length of the horizontal axle was 12 feet; about 4 feet from the end attached to the upright post, an old mill-stone was fixed, which revolved with the spindle on the paved course. Mr Tytler afterwards used a stone of much greater weight and thickness. The diameter of this latter stone was 4 feet 2 inches, and its thickness, which was uniform throughout, 17 inches. At the other end of the spindle a swingle-tree

was hung, which also worked in a swivel. The expense of the whole apparatus did not exceed L. 5.

A proper quantity of whins having been spread round in the course of the stone, the mule was attached to the mill by the swingle-tree, which it drew with perfect ease. The boy followed the stone with a pitchfork in his hand, with which the whins were constantly turned as the stone passed over them; when sufficiently bruised, they were forked into a large frame wheelbarrow, such as is used for turnips, and the course filled anew with whins. About three hours' work finished the whole; and the food thus prepared was wheeled off to the stable.

The horses, says Mr Tytler, continued to manifest the same relish for this food as at first; and, in the course of a few weeks, a most material improvement in their condition was observable, particularly in their coat. No horse, sweated under body-clothes, ever showed a sleeker and finer coat than these horses did, after they had been six weeks on this kind of food; and, though some of the severest work performed upon the farm was done while under the first year's trial of whins, they not only kept, but improved, their condition during the whole season.

This system of feeding was regularly pursued from its commencement in November till the middle of March. The horses had, along with their whins, as much straw as they could eat, and 3 lb. 2 oz. of oats per day till the beginning of February, when their allowance of oats was doubled. In the next year, 1813, the whin-feeding was begun on the 26th of November. The quantity given per day was weighed at different times, and, upon an average, was found to be 18½ lb. In the following winter the whin-feeding was begun on the 4th of November. The stock of horses was now reduced to eight, and, with the same expense of procuring and preparing the whins, a larger quantity could be afforded to be given them. Each of the six work-horses now got 28 lb., and the two other horses from 20 to 22 lb. Corn was now withdrawn from them during the short days of winter, and, when spring work commenced, they got only half their former allowance at that season, or 3 lb. 2 oz. The condition of the horses was certainly equal, perhaps superior, to what it had been during the former winter. The quantity of corn withdrawn appeared to be more than compensated

by the additional 10 lb. of whins. This feeding was continued, as in the former season, till the month of March.

It was always observed that the horses began to show a distaste to the whins about the commencement of spring. The shoots, says Mr Tytler, probably lose something of their succulence, or become less palatable from other changes which, at that season, the vegetable undergoes. Whenever the first indication of this was observed, the whin-feeding was discontinued. The same practice was followed in the next season, and was attended with the same satisfactory results. The whin-feeding commenced in the month of October, and continued till the usual period.

The expense which attended this mode of feeding, according to Mr Tytler's statement, taking the year 1815, was as follows:

Prior to the beginning of February.

Wages of a female cutting, per day,	L.0	0	6
Ditto of a boy employed in driving and bruising, also 6d., but one-third of the day at other work,	0	0	4
Supposed keep of the mule 6d.; also deduct proportion as above,	0	0	4
Straw, 8 stones,	0	2	0
	L.0	3	2

Or $4\frac{1}{2}$ d for each of eight horses.

After the beginning of February.

Wages of a female cutting whins, two-thirds of a day, for horses,	L.0	0	4
Ditto of boy, half a day,	0	0	3
Keep of mule, half a day,	0	0	3
Oats, 25 lb.,	0	2	6
Straw, 8 stones,	0	2	0
	L.0	5	4

Or 8d. each horse.

But where hay is given, add 4 stones at 1s., and deduct 4 stones of straw,	0	3	0
	L.0	8	4

Being 1s. $0\frac{1}{2}$ d. each horse.

The fitness and profitableness of whins as food, requires no further comment. The statements which we have given speak

for themselves. But the practice has in general only been pursued where the whins are found growing naturally upon a farm; and as these are not in sufficient abundance on a great number of farms where such a mode of feeding might be advantageously pursued, the practice has hitherto been very partial. The whin grows naturally on useless and neglected portions of ground, and even on such situations it is viewed by the farmer as a nuisance. To cultivate a plant which he is so anxious to eradicate, therefore, is much opposed to his common views of good management. But lands completely covered with whins can be cleared at a trifling expense.

Where the whin is to be cultivated, it must only be done on dry lands, as the seeds do not germinate on wet soils. The following method, adopted by Dr Anderson, may be followed:— After the land is properly prepared for a crop of barley, or such similar crop, the seed of the whin should be sown in the same manner as when the land is to be sown down with grass seeds. The quantity of seed used, may be from 15 to 30 lb. per acre. The young plants of the whin will spring up amongst the crop, and keep alive during the winter. And if the young plants are not choked up by grass or weeds during the early part of the next summer, the whins will grow rapidly after midsummer, and produce a pretty full crop in autumn, which may be cut and used as required so soon as the green summer food fails.

In some districts where fuel is scarce or expensive, the whin is employed for that purpose. It burns with much rapidity, and generates a great degree of heat. It is employed by bakers for heating ovens, and by lime-burners, brick-makers, maltsters, and the like. In commons and wastes near villages, it is much employed as fuel by the poorer class of people who cannot afford the more expensive kinds of fuel. The whins are partially burned during the winter before being cut down; but in this process, the smaller thorn-pointed branches only being consumed, the larger woody stems are left entire. These are hoed up and carried home generally by the females or children. In this state they are enabled to carry a larger quantity, besides these woody parts continue longer in burning. In some gravelly or sandy wastes which cannot be profitably improved, whins are turned to good account. They are cut over every third year, and sold for fuel. This, in several parts of England, will yield

a clear profit of from 10s. to 15s. a-year per acre, on lands which would not otherwise yield 1s. per acre.

The uses of the whin as a fence are of much importance. On dry, maritime, or barren situations, where the thorn exhibits a shyness of growth, this plant is found to thrive remarkably well. The formation and treatment of whin-fences have been treated of by a number of botanical and agricultural writers, as Lord Kames, Dr Anderson, Marshall, Billington in his work on Planting, Dickson in his *Modern Husbandry*, and others; there is also an Essay on this subject in the 4th volume of the Highland Society's Transactions, by Mr Gordon of Swinzie; and it is noticed in a number of the County Reports. But without giving a detail of the practices recommended by these authors, the present remarks shall be confined to the method of making and keeping these fences adopted in some of the south-west districts of Scotland, which is simple, cheap, and efficient.

The wall or fence is made 6 feet wide at bottom, 20 inches wide at top, and about 6 feet high. Each side is built with firm sods or turfs, and the middle is filled up with earth; the top is also filled up and rounded over with the same material. This earth, together with the sods employed in building the sides of the wall, is taken from the spot, a shallow ditch being left on each side of the fence, with an interval or scarcement of 4 inches between each ditch and the wall. The expense of making a wall of these dimensions is from 1s. 6d. to 1s. 9d. per lineal rood of 6 yards. The whin-seed must be sown in a row along the top of the fence, immediately after it is made, in order to insure germination before the fresh earth on the top has become dry. The best season for sowing the seed, and consequently for making the fence, is during the months of March and April. One lb. of seed will sow about forty roods; the cost of the seed is 1s. 6d. per lb. These become complete fences the second year after they are made, and thus require no rails. The only treatment which they afterwards receive, is, that the whins are generally cut over every third year about the month of April; but this is altogether unnecessary, for when regularly pruned or trimmed once a-year, they will require no cutting over. Fences constructed and treated in this way, are found to form a complete barrier even for the wildest sheep and cattle.

The whin possesses many advantages over other plants as a fence. It is an evergreen, and presents the same beauty, and the same shelter in winter that it does in summer. It will grow in soils and situations where the thorn and other plants are shy of growth. It is much more easily raised than the thorn, and becomes much earlier a complete fence; and were as much care bestowed on it, as is, or ought to be, bestowed upon the thorn, it would, at all times, be as efficient a fence. The roots of the whin, and the moisture which the plant attracts, prevent the mound from pulverising down; and when the whin is regularly pruned, such a fence will stand for a long time. Unfortunately, however, for the credit of the whin, it is frequently employed as a fence only on pasture-lands of an inferior value, where the easy habits of the farmer allow it to grow in its natural state. In such circumstances, when the plant pushes away to wood, the smaller under branches decay and leave gaps in the fence. Another evil attending this careless system is, that the superincumbent weight of the bush is readily acted upon by high winds and heavy falls of snow, which bring down both the bushes and the mound. But this is a fault in the practice, not a defect in the plant. We have recently seen, on a part of the barren tract of the Lammermoor Hills in Berwickshire, a whin-fence reared with much advantage. It is regularly trimmed every year, and a neater, compacter, and more beautiful fence, cannot be desired.

There are generally two objections advanced against the adoption of whin-fences.—The first is, that the wall or mound required for raising the whin is of such dimensions as to occasion a great waste of ground;—and the second is, that the whins have a great tendency to spread over and injure the adjoining grounds.

The dimensions of the fences given by most of the authors we have named, are such as would lead us to condemn the use of the whin-fence, except on wastes or lands only of a nominal value. But for the kind of fence which we have described above, and which is found to answer admirably well, the ground required is not more than is necessary for a proper thorn fence. And with regard to the objection on account of the dissemination of seed, the injury is only felt where the whins are neglected. It is known that thorn-fences which are regularly trimmed, do

not produce flowers. Indeed the same law holds good with shrubs in general, under such treatment; and to this the whin is not an exception. When it is regularly switched once a year, there is no danger of its being disseminated by the seed. And even according to that practice which we have stated, of cutting over once in three years, the injury from this cause is not felt.

Where the whins are allowed to run to seed, and be disseminated over pastures, they may be taken up at a trifling expense. When the ground is soft after a fall of rain, plants one or two years old can easily be pulled up by the hand. The whins prove injurious only in pasture lands; in lands under tillage they are never so.

Upon the whole, we greatly approve of the adoption of the whin as a fence in many cases even where the thorn can be raised. We conceive it also to be deserving of attention as food for domestic animals. It is found, as we have seen, to be a very nourishing plant, and remarkably well suited to the habits of certain animals. And it is used during that season of the year when green herbage cannot be had. It is not indeed on the richer and finer class of lands, that we are prepared to say it can be profitably cultivated. The crops which such lands would yield under the usual course of tillage, would, we must suppose, much exceed the value of a crop of whins. But in a large portion of the kingdom, and even on waste parts of grounds in the richest and most fertile districts, the whin we conceive may be advantageously used. From the month of October, when it has arrived at the extent of the year's growth, till March or the beginning of April, when the juices of the plant become strong and disagreeable, is the season for using it. During this period, too, the labours of the husbandman are not so much in requisition, and the procuring and preparing of the whins can be performed at a moderate expense.

In preference to the modes of preparing the whin which we have pointed out, we conceive that, in many cases, it might be expedient to possess machinery of the nature of a common grinding mill for the purpose of bruising not only whins, but straw, and the dried stems of various plants, for the feeding of domestic animals. This method of preparing the stems of gramineous plants, has recently attracted attention on the Continent.

ON THE PLANTING OF HARDY EVERGREENS.

Hints on the Planting and General Treatment of Hardy Evergreens in the Climate of Scotland. By WILLIAM MACNAB, Superintendent of the Royal Botanic Garden of Edinburgh. 1830.

IT is in winter that evergreens delight the eye, and enliven the sylvan scene. When the oak is shorn of its foliage, the pine and the holly present the verdure, and recal the images, of spring. It is surprising, then, that so little care is bestowed on so easy a method of adding to the interest and variety of the deciduous forest, as by a judicious intermixture of these beautiful plants. Besides the purposes of ornament, too, they are not without value from their wood. They may grow as underwood, without interfering with the progress of the larger timber. And if we can be allowed to think of cruelty, amidst the lovely serenity of the forest shade, they afford to the sportsman the means of enjoying his captivating but destructive art. Nor is it because these plants are too delicate to brave the severity of our winters, that they are not more generally planted. Many hardy evergreens stand with impunity even the highest altitude at which forest trees can be raised in this island. The common holly, and the rhododendrons, for example, never suffer in their wood or their foliage from our severest winters.

One of the chief causes which retard the general propagation of evergreens, arises from the numerous failures that take place when they are transplanted. Various eminent botanists, and arboriculturists, have treated of the planting of evergreens; and their opinions differ considerably on this point. Some recommend early in autumn, as August, September, and October, or late in spring, as the end of March, April, or early in May, as the best time for planting; others, besides some of these months, include August and February; but all recommend one or other of the months we have named. Nurserymen, too, are known to send out the largest quantities of these plants in April and May, or in August and September. Now, with such long established practices as these, how ever faulty they may be, people will rather continue to pursue them, than run the hazard of ridicule, which is generally the reward of a new attempt, even though that attempt should be attended with somewhat better success.

But when a practical arboriculturist, and eminent botanist, such as Mr Macnab, to whom we are indebted for the little pamphlet quoted at the head of this article, presents to us the result of patient observation, and extensive experience, he has nothing to fear from the inoffensive scepticism of the theoretical planter. Whoever has seen the Botanic Garden of Edinburgh, and is aware that the numerous beautiful and luxuriant evergreens which it contains, have all within the last ten years been either transplanted from the old Botanic Garden, or planted anew, under the immediate superintendence of that gentleman, will perceive that Mr Macnab has formidable examples to bear out his case. A more extensive assortment of evergreens in such a state of vigorous growth is not perhaps to be seen in Britain.

Mr Macnab's opinions and practice of planting evergreens are very different from those we have mentioned. He says that he has planted evergreens at all seasons of the year, with more or less success, though, from the middle of June to the middle of August, is the most unfavourable time for planting them. The particular seasons which he recommends, are late in autumn, or during winter, or very early in spring; that is, from the middle of October till the middle of February. And of this period, he recommends, as the best, from the middle of October till the middle of December, provided the weather and the ground be favourable; that is, provided there is no frost, no drying wind, nor much sunshine, and the ground is not too much saturated with wet, either from continued rain, or from the nature of the soil.

Mr Macnab also differs from others in the treatment of the plant, when putting it in the ground. Some recommend, when the plants have been long out of the ground, to be particular in drying their roots, by exposing them as much as possible to the sun and air, and not to be nice in planting. But the following are Mr Macnab's views on this subject:—"One of the principal things to be attended to in planting evergreens," says he, "is to fix on a dull day for winter planting, and a moist day for spring and autumn planting. There can be no secret in the proper treatment of evergreens. If there were, I should say that it is in preventing their roots from becoming dry, when out of the earth; to choose moist and cloudy weather for planting; and still better, if we had the power, by foresight or otherwise, to

secure a continuance of such weather some time after they have been planted. If the roots of evergreens be allowed to dry when out of the ground in spring, it is scarcely possible to prevent their suffering considerably, and showing this injury a long period after they are planted." And hence he recommends the winter months as being those in which we are best able to attain these purposes, the day being in general moist and cloudy, and even when it is sunshine, the sun being such a short time above the horizon, and its influence so trifling as to have little effect. But where that kind of weather cannot be obtained, he then recommends the work to be performed in the evening, after the sun gets low, particularly in spring or autumn planting.

The following are his directions for the details of planting:—"In planting evergreens," says he, "whether in a dull day, a wet day, or a dry day, it is very necessary to keep in view the expediency of keeping the plants for as short a time out of the ground as possible; if only a few minutes, so much the better; and, in all cases where it can be done, where great numbers are to be planted, we should, if possible, have some men stationed to take up the plants, others to carry them, and a third set to put them into the ground. In all seasons, situations, and soils, the plants should be well soaked with water, as soon as the earth is put about the roots." Though he recommends universally the practice of watering immediately after planting, he remarks that the urgency of the case is less where the evergreens are planted in winter, to form underwood in extensive plantations; and that the deaths, without watering, will be so few that they are not worth avoiding, where it costs much expense and trouble. "As soon as the plant has been put into its place," continues Mr Macnab, "the earth should be filled in, leaving a sufficient hollow round the stem, and as far out as the roots extend, to hold water, which should then be poured in, in sufficient quantity to soak the ground down to the lowest part of the roots. In short, the whole should be made like a kind of puddle. By this practice, which is particularly necessary in spring and autumn planting, the earth is carried down by the water, and every crevice among the roots is filled. Care must always be taken to have as much earth above the roots of the plants as will prevent them from being exposed when the water has subsided." An old birch-broom, or any thing similar, he observes,

ought to be laid above the roots, to break the fall of the water when it is poured upon them, and to prevent the roots from being washed bare of such earth as may adhere to them. This thorough watering is so indispensable, that it is to be applied even although it should be raining at the time of planting. After the water has been absorbed, the earth should be levelled round the stem of the plant, and as far out as the water has been put on, but not trodden. If the plants are large, a second watering is sometimes necessary ; but, in ordinary-sized plants, one watering is quite sufficient ; and, after remaining twenty-four hours, more or less, according to the nature of the soil, the earth about the stem, and over the roots, should be trodden as firm as possible, and, after treading, should be dressed with a rake.

Such is a brief account of Mr Macnab's system of planting evergreens ; and if they are planted in this way, or in some way similar to it, and during the winter season, he assures us that the risk from failures will be very trifling. In ordinary-sized plants, that is, from one to two and a half or three feet high, he says it is desirable to leave as much earth about the roots as possible, though this is more for preserving them from being injured, than from any advantage to the plant. Much larger sized plants cannot be moved with success without keeping a large ball of earth as entire as possible about their roots.

But our limits will not allow us at present to follow Mr Macnab through all the details of his practice. For his remarks on packing plants when sent out of a nursery ; on keeping them moist both before and after being placed in the earth, before they are finally planted out ; his instructions regarding getting plants in a young state ; on not watering plants at all in dry weather, or doing it only when a shower of rain falls, or in the evening, and in either case when it is done, doing it completely ; and his instructions for making composts and substitutes for moss where plants require such soils ;—for these, and many other useful remarks, we must refer to the pamphlet itself, which will be read with pleasure by those who feel an interest in the propagation of evergreens ; and not the less so by those who are acquainted with the unassuming manners and real worth of its author.

ON THE COMMUTATION OF TITHES.

A Bill, entitled An Act for encouraging and facilitating Compositions for Tithes, and other Payments arising and payable to Incumbents of Ecclesiastical Benefices in England and Wales,—Ordered to be printed 10th May 1830.

ALL reasonable men will agree, that if it be wise to recognise a National Church, it must be but justice to afford such support to those who are called upon to perform the duties of the ministry, as shall maintain their personal dignity, recompense their labours, and hold out a fitting reward to learning and virtue. Nor do we imagine, that, amongst the more temperate part of our countrymen, any wish exists to deprive the church of a just and even munificent provision; for nothing could be more illiberal than to seek to degrade the members of a learned profession, whom we call to perform public duties, which we admit to be salutary, and even necessary, and for which the long labour of learned studies is required. Indeed, the revenues of the church of England, though ample, are not excessive, when we regard the number and character of the individuals whom these revenues must maintain, the duties which they are required to execute, and the station which they are expected to fill in society.

It is computed by the author of a pamphlet recently published, and to which we shall have occasion to refer in the sequel, that the total revenues of the Established Clergy of England and Wales amount to L. 3,872,138 Sterling*. Although the data from which this result has been obtained are not so precise as could be wished, it is probable that the estimate is not understated. Now the number of benefices of all kinds (according to diocesan returns) is 10,582; so that, supposing each benefice to be filled, and the revenues to be equally divided, each member of the church would receive a yearly income of L. 365 : 18 : 4; which cannot be considered an unreasonable allowance for well educated men. These benefices, indeed, are held by about

* The Revenues of the Church of England, not a Burden upon the Public.

6000 persons ; so that the existing revenues could yield to each of the present incumbents about L. 645 a-year ; but even this, surely, cannot be termed excessive. Unhappily, however, these revenues are not only not equally apportioned amongst the members of the church, but the inequality of the division is so great, that while many individuals enjoy endowments little short of the revenues of princes, numbers are paid by a pittance scarce exceeding the wages of common mechanics. This, perhaps, even more than the mere amount of the endowments, tends to nurse those angry feelings towards the Church Establishment which have unhappily spread too widely amongst us. This part of the subject, however, is in no degree necessarily connected with that upon which we are about to enter. The present question is not the manner in which the revenues of the church are apportioned amongst its members, but the manner in which they are levied upon the country.

And, in this respect, it is grievous to think how just a cause exists for censure and regret. The impost of a tithe has not only been long regarded as a public injury, but is felt by all who are subject to it as a personal grievance. While it seems to fall a burden upon the produce of land, its influence extends far beyond the sphere of the landholder. It affects production, and the free application of capital, in the most important of all the branches of domestic industry. It is oppressive in the mode of exaction, and is thus unjust to all whose situation subjects them to it ; while, by the endless quarrels to which it gives rise, it tends to degrade the church, and weaken the influence of the ministry. We do not mean, however, to contend, that this part of the property of the clergy shall be secularized : we are merely to argue, that a burden so palpably pernicious and oppressive, shall be converted into a just equivalent, and be rendered a tax, not upon industry, but upon land.

During the very first age of Christianity, no trace, it is well known, of this impost can be found ; and for the long space of nearly four hundred years, the teachers of religion were maintained by the freewill-offerings of converts. In progress of time it became common for the Doctors and Fathers, to stimulate the zeal of the faithful in the offering of those gifts, by appeals to the examples of the Patriarchs, and the laws of Moses. Chris-

tians were conjured not to bestow a smaller portion of their substance upon the Holy Church, than Abraham had paid to Melchizedek, or than Jacob had vowed to the Lord, or than Moses had assigned to the tribe of Levi, namely, a tenth part of the yearly increase. Hence the offerings, though paid in small portions, and termed *oblatae*, came soon to be called *decimæ*, tenths or tithes; and the convenient analogy of the Levitical law was never again lost sight of in all the arguments in favour of the church.

And, during the progress of the fourth century, these claims were still more absolutely urged, and some say received the sanction of the civil power by a law of Constantine, ordaining the payment of tithes throughout the empire*. If this law were ever carried into effect, it was soon disregarded in the subsequent changes of the imperial dynasty, the destruction of the empire, and the establishment of the barbarians. But the church had a resource in its spiritual powers,—its excommunications and anathemas. These have come down to us in innumerable records; and while we must condemn their object, it is impossible not to admire the constancy and spirit with which such monstrous pretensions were forced upon barbarous nations, in opposition to the strongest bias of interest and habit. In the provincial council of Tours, held in 567, a strong exhortation was issued, calling upon the faithful for their gifts and offerings as of old. But in the second council of Macon, held only 18 years afterwards, namely, in the year 585, a bolder tone was assumed, and a solemn decree was issued, demanding the payment of tithes as of divine right, under the pain of excommunication. Let the offender, says the canon, “*a membris ecclesiæ omni tempore separetur.*”

A few years afterwards, a similar canon, in terms still more authoritative, was made by the council of Seville. “Let every one, rich as well as poor, truly offer to his lawful church all the first fruits, and a tenth part of his cattle, as well as of the fruits of the earth. Let every husbandman and every artificer give a just tenth part of the fruits of his labour. For as God hath given all things, so he hath demanded that a tenth part shall be given back to him again. Thus, we demand, of the fruits of the

* Code Theodos.

field, and so also of every kind of food; as of bees, so also of honey; as of lambs, so also of fleeces and cheese; as of hogs, so also of goats, of oxen, of horses; as of great things, so also of small; *et cæteris*. If any one shall not bestow his tithe of these things, he is a defrauder of God, he is a thief and a robber; and may the curse which God inflicted upon Cain for not dividing his offering aright be heaped upon him*." And in the council of Friuli, in the following year, a canon to the like effect was made for all Italy.

Such throughout western Europe were the progress and triumph of this memorable imposture; for we need not say, that the Christian law gives no warrant for such an exaction. The gracious Founder of our faith makes no claim upon the goods of his followers like this, and not a text of Scripture can be tortured into a justification of it.

But besides the authority of the canon law, the sanction of the civil power was obtained in every country which yielded obedience to the church of Rome. The first law of this kind which is fully authenticated, is that of Pepin of France in 764. But the most memorable are those of his son Charlemagne, whose decrees and capitulars were acknowledged throughout France and a great part of Italy and Germany. At what precise time the sanction of the civil power was given to the claims of the church in this island, has been matter of dispute amongst historians and antiquaries. The first grant or charter recorded after the reduction of the seven Saxon kingdoms, is that of Ethelwolf, passed in a parliament held at Winchester in November 785. This charter is recorded by three of the oldest English historians, namely, Ingulph, Abbot of Crowland and Secretary to William of Normandy, William of Malmshury, and Matthew of Westminster. Its authenticity, or rather its purport, has been questioned, although we think without much reason. The matter is solely for antiquaries, and is not needed to establish the undoubted historical truth, that, in the reigns of the Anglo-Saxon kings, the claim of the church to tithe received the same secular sanction which it had obtained in other countries. Other grants and charters by subsequent kings are recorded, the frequent

* Ivo. Carnal. P. 2. c. 174.

repetition of them evincing the troubled state of the times, and the difficulty of enforcing obedience. The different laws of the kingdom, comprehending those relating to the church, were collected and confirmed, as is known, by William the Conqueror, and were long known in England under the title of *Leges Sancti Edwardi*,—le glorious Roy Saint Edward, as he was termed in the Norman French of the coronation oath.

Thus early was the civil right in tithes accorded to the church in England, and many subsequent laws confirmed the title. Exemptions, indeed, and infeodations to laymen, took place at various times, and on many pretences. This occurred in other countries as well as in this, and in none more than in Italy, where, by continued lay-impropriations, very little of the tithes at length remained in the hands of churchmen. The principal encroachments of this kind in England seem to have occurred during the reigns of the first Norman kings, who, although sons of the church, were very barbarous and disobedient ones. Yet, notwithstanding of the infeodations of those times, and the far greater spoliation of the church property at the Reformation, the Church of England was at once a liberally endowed one, and now, by the progress of opulence in the country, has become one of the richest in the whole world.

The canonists, we have seen, claimed the payment of tithes by a divine right; and this not the less after the secular power had, in every country, granted a civil right. If churchmen owed their right in tithes to the civil law, then it was seen that the same power that gave the right could take it away. If they could claim it by the express law of God, then it was above all law, imprescriptible and unalienable by the civil power. And this lofty pretension the Church of Rome has never for a moment compromised, however it may have been forced to yield to sacrilege and violence. The Church of England has been in nothing behind that of Rome in these pretensions, although itself the creature of the civil power, and holding all its privileges by law. The divines of this church refer us for examples of the right in question to Cain and Abel, to Abraham and Jacob, and entertain us with learned disquisitions on the number 10, as how this chanced to be the portion so generally fixed on for the sacred service; and why, while the sacred law demanded a

seventh part of our time, it only required a tenth part of our substance *.

But the Levitical law, as may be supposed, is that which has furnished the most mighty arguments for the divinity of tithes. When God incorporated the people of Israel into a civil state, he consecrated the tribe of Levi to the service of the altar, and commanded that a tenth part of every man's substance should be given to them for their maintenance †. The Levitical law indeed has some puzzling peculiarities. In the first place, that law seems very clearly to have been intended for the land of Canaan. There is nothing like evidence that it was intended for Kent and Norfolk. In the second place, the Levites were prohibited from having any part or inheritance in the land, which would ill accord with the divine right of glebes and church lands. Thirdly, the Levites were a whole tribe,—a twelfth part of the Jewish nation; whereas our teachers do not yet amount to that proportion amongst us. This last matter seems to have perplexed the divines. The good and learned Dean of Norwich, whom we have quoted above, labours to show that the tribe of Levi was the least numerous of all the descendants of Jacob. We do not know how it chanced that the Levites did not breed up “to the level of subsistence,”—to a tenth part of the produce of the land which they enjoyed. They had besides little else to do than to add to their numbers, at least according to Dr Prideaux, who informs us, that they could not, on an average, be more than two days each in the year employed in the service of the temple. Hence the good Dean very logically argues, that “the work incumbent on our Christian priesthood is not lesser than was that of the Levitical, but vastly greater;” and that, consequently, they are as well entitled to tithe as the Levites. Besides, the Levites were allowed to go to war, and take commissions, we presume, in the Guards of those times, which our Levites are not permitted to do. Whether they were allowed to practise in the courts, and take briefs and fees, we do not know; but certain it is, that they were not obliged to go to Oxford to study Hebrew. But all their charges, on the one hand,

* The Original and Right of Tithes; by Humphrey Prideaux, D. D. Dean of Norwich, 1710.

† Numbers, chap. xviii.

and their duties and perquisites on the other, down to the leaves and skins of the sacrifices, are minutely summed up, and the result shown to be, that the pastors of the Church of England have more to do, are worse paid, and better deserve to be paid, than the Levites*.

We will not insult the understanding of our readers, by citing the *Christian* warrants for the exaction of tithes. These will be found in a few texts of Scripture, which, perverted from their plain and simple meaning, have been employed by divines, Catholic and Protestant, in support of this monstrous claim.

The first grave attack made in England upon the divine right of tithes, was by the learned and ingenious John Selden. This profound antiquary treats the subject of tithes historically. With great learning he traces their origin and progress from the earliest times, treating fully of the maintenance of the church during the first ages, the advancement and confirmation of the claim of right under the canon law, the arbitrary consecrations, appropriations, infeudations, and exemptions, during the middle ages, the establishment of the parochial right, and of the modern payment of tithes in the different states of Europe; and the opinions of lawyers, schoolmen and churchmen concerning them. He professes that he does not mean to impugn the divine right of the church to tithes, but merely to give their history. In this history, however, he shows very clearly what his real opinion is of the *divine* right; and of this the clergy were at once sensible, for no sooner did the work appear than it was assailed by a host of angry opponents,—Mr Montague, Dr Sclaiter, Dr Tillesley, Sir John Semple and others; and indeed, it became a mark to be shot at by all who afterwards took their pens in support of the insulted *jus divinum* of the church,—as Dr Comber, Dr Forbes, Sir Henry Spelman, Dr Prideaux, and many others. It must be confessed, that the learned antiquary too fairly exposed himself to these attacks. He plainly wrote to support a system, and this so untenable a one, that we believe no antiquary has since attempted to vindicate it. He will have it, that the acts and charters of the Anglo-Saxon Kings were either forged, interpolated and corrupted by the zeal of monks and churchmen, or were not obeyed beyond the

* Prideaux, pp. 76—83.

domains of the prince. He argues, therefore, that tithes had not that early civil sanction which has been claimed for them by the zeal of their defenders, but were gifts of the laity, conveyed by grants and charters to the different churches, by their patrons or founders. The whole hypothesis, however, is opposed to historical records, and to the known history of the tithe in every country which yielded obedience to the papal decrees. The sanction of the civil power to the canonical claim of tithes previous to the Norman Conquest, is beyond the reach of reasonable dispute; and with regard to the supposition that the right to tithes was, in the case of our various churches, conferred by the consecration of the tithe by the landholders, it is known to be unfounded. The canon law required that tithes should be paid to the lawful church, whether cathedral or parochial; but in those early times, the rights of patrons and founders were vague and undefined, and they frequently assumed the power to found churches and religious houses, and to give them grants of such tithe, or portion of the tithe, as they thought fit. Hence we find one man giving a grant of his tithe of corn, and one of his oxen, and the like. These consecrations, or dissecrations as they may be rather termed, were generally made with consent of the Bishop of the Diocese, though often without his consent, which gave rise to the Canons of the Council of Latherau, first, in 1179, and next in 1215, prohibiting all consecrations of this nature, "*sine consensu Episcopi.*"

We need not, however, pursue this melancholy history. The divine right of tithes, like that of kings, has at length silently given way to the progress of opinion and common sense; and the clergy of England now find themselves compelled to rest their claim of privileges upon a humbler foundation. It is manifest that their rights are solely civil. They hold their possessions by law, as they themselves exist by law. The law, indeed, by which the clergy of England hold their civil possessions, is very ancient. Admitting that they hold their privileges by the same tenure as the church to which they succeeded, their titles are nearly coeval with the monarchy itself. On whatever pretence, then, the right to a tenth part of the produce of the country was at first obtained, and however unwise the laws may be held to be which confirm-

ed the claim, the right to the property is now in the church, as an incorporated body, and by laws as valid and as ancient as those by which any property in this country is inherited or possessed.

But then, assuredly, this church, as an incorporated body, is in nothing placed beyond the reach of law. The rights which it holds are the rights and privileges of the ancient clergy, or such parts of them as the civil power thought it fitting to assign, when the ancient religion was abrogated. Such are the rights of all the reformed churches of Europe; and we believe that in no other but that of England, have the clergy presumed to claim their civil possessions by any other tenure than that of the civil law. The canon law, on which the clergy of the English Church have claimed their civil possessions, was burned by the hands of Luther, and never admitted at all by the followers of Calvin. The Church of England, then, holds its privileges and possessions under the sanction of law, and the same power which gave these rights, or which permits the exercise of them, may, if it shall seem just, and for the common good, restrain them, regulate them, or take them away. The church itself, as a corporate body, exists solely through the will of the nation, expressed through the lawful organs of the state; and its existence as a recognised body must cease, if the will of the nation, expressed through its lawful organs, shall so determine.

But although, as we have said, there is not another reformed church in Europe which has dared to arrogate to itself rights and an existence independent of the civil power, we find persons amongst ourselves silly enough to listen to pretensions nothing short of the exploded *jus divinum*. They speak of the church as of something independent of the civil power, and as possessing rights beyond the reach of the law. They speak of alliances between church and state, not perceiving that this is a form of expression which either means nothing or must lead to false pretensions. No alliance can be recognised of this nature, but the alliance between the governors on the one hand, and faithful subjects on the other. Such pretended alliances have hitherto produced only evil to the human race. Alliances!—unhallowed leagues, let them be termed rather, against the rights of man and the liberty of conscience!

But it is plain that the most zealous advocates of the rights of the church can place them upon no surer foundation than upon charters of the crown confirmed by acts of Parliament. And granting the rights thus established to the utmost limit to which any legal right can extend, it is obvious that there is yet another right, as much founded on reason and the rights of man in society, as the right of the church to tithe, and that is, the right of every succeeding generation of men to govern itself. If this law of tithes is a bad law,—and we shall endeavour to show that it is a very bad one, false in principle, injurious to public industry, and unsuited to the state of society in which we live,—then surely no reason can be given why this, more than any other law, should subsist. Because a generation of men a thousand years ago agreed to submit to an evil law, is every succeeding generation of men, possessing the same right of governing themselves—more capable of governing themselves, and of knowing what institutions are suited to their altered circumstances,—to submit to the same law for ever? To argue thus, were to argue against one of the first and most necessary rights of man in society. The human race would remain for ever stationary in all its institutions, if such a principle were admitted.

But we have seen lately another species of argument brought forward with some parade in support of the right of the English clergy to tithes, and this in direct and ludicrous opposition to all the former arguments of the divines of this very church,—arguments urged with zeal until the very times in which we live, and only discontinued at length, because the common sense of mankind would no longer endure them. It is said, that the tithe was a mere voluntary grant by proprietors to parishes and to the churches which they founded, and that the grant of tithes is in the mere condition of a voluntary conveyance of land or any other property. It cannot be affected by law, because the law cannot, without injustice, touch private property.

This, it will be seen, is the mere revival of the paradox of Selden, without those who use it adverting to the purpose for which Selden advanced this hypothesis, which was very different from that of strengthening the rights of the clergy to their civil possessions. In the first place, the supposition is not true, as we have endeavoured to show; and, in the second place, if it

were true, it would in nothing favour the argument which it is designed to support.

Admitting that the grants of tithes were at first made in obedience to the canons of the church, that separate grants of the tithes of each estate in land were made by its owner to the church, how would the validity of the claims of the church be thereby strengthened? Would this be a better title to property than that granted by charters of the crown, and confirmed by statute? Are we to be more bound by the acts of private men than by the acts of the governing power? The tithe is not only a conveyance of property, but it is an impost upon property, and an impost of the worst kind,—a tax upon the gross produce, without relation to the net return. If there be one natural right, it is the equal right, to use the language of an illustrious writer, of each succeeding generation of men to the earth and all which it produces. The earth is the great capital stock of the country for the support of its inhabitants, and it is only inherited and possessed by private men under the laws of society, and for the good of society. The power to inherit property is a right, as all jurists agree, not of nature, but of positive institution, and the inheritance of property is, accordingly, in all countries regulated by law; and are we to submit, not only to a perpetual conveyance and inheritance of property, but to a barbarous and injurious impost upon the land and labour of the country, because, forsooth, it was imposed by the acts of private men? Are we to pay more regard to the acts and decrees of private men, who have lain for centuries in their graves, than to the public and recorded acts of the state itself? The argument is absurd.

And with regard to *voluntary* gifts of tithes, what do these writers mean? Have they ever heard of the canons of the Church of Rome? Have they ever heard of those ecclesiastical decrees, as formidable to their victims as death itself, which claimed the due of tithes as a grant of heaven, and denounced the withholding of them as a sacrilege, which inferred the penalties of perdition? We have given a sample of the words of one canon touching this matter, and we could give fifty more. But who is ignorant of the force of ecclesiastical decrees, during those ages of ignorance and imposture, and when no right was more imperiously urged throughout all Christendom than the payment of

tithes? To speak of voluntary gifts of tithes under such circumstances, is a mere abuse of words.

This detested impost, then, the result of fraud, has not a single character, more than any other law, which places it beyond the reach of the civil authority. No private man had a right to impose a tax upon the industry of future ages, and no body of men can inherit a right which the laws do not sanction. The church, like the bench, is supported for the public benefit, not for the good of its own members; and clergymen, like judges, have no heirs to the privileges and possessions of their office. Each clergyman is but a tenant for life, in so far as his ecclesiastical revenues are concerned, and it rests with the governing power, whether the privileges which he enjoys shall ever be inherited by another man. In this respect, the church differs wholly from any incorporated body of private men, as bankers and companies of merchants, or from lay-proprietors of tithes. These have heirs to their civil possessions. The individual members of the church have no heirs to their ecclesiastical endowments.

One right, indeed, founded on equity, the members of this establishment may justly urge, should the Legislature resolve to regulate the possessions of the church, namely, that no individual clergyman put into the possession of a benefice, shall be dispossessed of any part of the income which he now enjoys. The clergyman who received the benefice, received it under the sanction of the laws existing, and under the expressed and implied condition that he should enjoy it for life. To this claim of equitable right, the feelings of every honest man in the country will respond. To take from any clergyman the income which he received under the sanction of public faith, were cruelty, not justice, violence, and not the exercise of a salutary right of government; and none but profligate or ignorant persons will counsel a course of plunder, which would break down the barriers that protect the rights of private men. But the clergy need entertain no fear of this nature. In no country have such rights been so respected as in England, as we see exemplified in the case of so many public servants and functionaries, whose employments it has been deemed expedient to abolish or to regulate. If the nation shall exercise its undoubted privilege of regulating the possessions of the clergy, as

surely the right will be exercised with temperance and honour. But if the clergyman receives the profits of his benefice during his life, or a just equivalent for it while he lives, every claim of justice is satisfied, in so far as he, or the body to which he belongs, is concerned.

Although the civil power possesses the indubitable right to regulate the possessions of this class of public servants as much as of any other, we do not, as we have said, propose to recommend the secularization of the revenues of the Church of England, nor even of that of Ireland. Whether the revenues of the former may not be more equally divided, and those of the latter applied to a more beneficial purpose, than the supporting a few great sinecurists, is a grave and important inquiry, but in no degree necessarily connected with that of the commutation of tithes. Much less do we speak of a secularization of tithes in favour of the lay-proprietor, or the farmer. Nay, we have never seen such a proposal made by any one. The lay-proprietor, although he has a just right to demand a regulation of the tithing system, has none to require that the revenue derived from it shall be confiscated to his use ; much less the farmer, whose interest in the property is only temporary. The one purchased or inherited his land, and the other acquired the right of possessing it for a time, subject to the payment of this tax. But in all the arguments we have ever seen urged, we repeat we have never seen a claim of this kind set forth, either by landlord or tenant, though it is generally made a prominent part of the argument of those who raise an outcry against a change of the tithing system. This manner of arguing is uncandid. Although the State may justly, if it shall seem for the public interest, secularize the tithes, there is scarcely a conceivable case in which it would be for the public interest to do so in favour of the proprietors or occupiers of land.

And what is the nature of this impost which has been so long regarded as a grievance by all who are subject to it, and condemned as a public injury, not less than a private wrong ? It is a tax upon the gross produce of labour and capital employed in cultivation—a tax levied in kind of a portion of the gross produce of land without reference to the expense of obtaining that produce. It may thus be a tax equal to the whole net produce ;

and it is, in innumerable cases, a tax greater than the whole net produce would be,—and thus it is, in innumerable cases, a prohibition on the expenditure of capital on land.

Let it be supposed, that, to improve and cultivate a piece of ground, and to pay the rent which it would produce if uncultivated, would require nine-tenth parts of the whole produce, then it is obvious that a tax, equal to one-tenth part of the whole produce, would leave no free produce. For example,—and the example has been often given,—let it be supposed that to improve a piece of land, and pay the rent of it, requires L. 9 Sterling, and that the whole produce is L. 10 Sterling, a tax equal to one-tenth part of the whole produce is L. 1, which is equal to the whole of the free produce.

Nor is the supposition an extreme one. The cases must necessarily be of perpetual occurrence, where, in the laying out of capital on land, a tax, equal to a tenth part of the whole produce, will be equal to, or greater than, the whole of the free produce. In all such cases the tithe is a prohibition to the expenditure of capital on the improvement of land.

It used to be, and still is over a great part of the country, a common calculation, that one-third part of the total produce of land is paid as rent, one-third as expenses, and that one-third is left to the farmer for profit, the risk and interest of his stock, and the expenses of his own maintenance. Now, a tax equal to a tenth part of the whole produce would, in such a case, be a tax equal to 30 per cent. on the portion which remains to the farmer. In proportion, however, as the expenses of cultivation increase, which is so in all cases of laying out fresh capital on improving land, the portion left to the farmer diminishes. The tax is thus constantly increasing with relation to the free produce, and it is thus acting in a constantly increasing ratio on the application of fresh capital on land, until it prevents its further application.

Thus let it be supposed that, in the case of land of a given fertility, the portion left to the farmer is one-third part of the whole produce, then we have seen that a tax of 10 per cent. upon the whole produce, is a tax of three times 10 per cent., or 30 per cent., on the farmer's portion of that produce. But if, from the increased outlay required, the farmer's portion is re-

duced to one-fifth part, then a tax of 10 per cent. on the whole, is equal to 50 per cent. on this portion ; and, if the expenses so increase as to leave only one-tenth part to the farmer, the tax of 10 per cent., as we have seen, is equal to 100 per cent. on this portion ; or, in other words, it is equal to the whole of the free produce. One can scarcely imagine a tax more utterly absurd in principle, or more mischievous in its practical consequences.

Nor has this oppressive burden the miserable merit of being alike oppressive in all cases. It is the most unequal of taxes : it presses with the greatest severity upon lands of the least fertility, for on them the expense of production bears the greatest ratio to the produce. For the same reason, it presses on all cultivated land with the greatest severity in unfavourable seasons, and thus falls with the greatest weight upon the farmer when he is least able to bear it.

Further, inasmuch as the tithe renders it, in many cases, more advantageous to abstain from cultivating than to cultivate, it is a premium held out to keep land in a state of grass rather than of corn. In this respect, it operates more or less on all the titheable land in Great Britain and Ireland ; and it is well known that a vast proportion of the land in either country is kept in grass that it may avoid the tithe.

But land, it is known, will produce a greater quantity of human food when it is kept in a course of tillage, than when it is kept solely in grass. By calculations easy and familiar to farmers, it could be shown, that land will generally produce from two to three times the quantity of sustenance for man, when cultivated, which it will do when uncultivated. Every acre of land, therefore, that is kept uncultivated for the purpose of avoiding the tithe, is, in this respect, less productive to the nation through the operation of the tithing laws.

Further, the tax is grievous and offensive in its nature, and mode of exaction. When a man has, with labour, and after the expenditure of his capital, and under all the hazards of the season, seen his crop matured and ready, he must submit to see another, who has not partaken of that labour, nor expended any capital, nor shared in the anxieties and numerous hazards of the business, step in, select, and, under vexatious regulations, carry off a tenth part of the entire produce. Such a mode of levy-

ing a tax, we must perceive, independently of all considerations of gain, is grievous to the person subject to it. No time, accordingly, is seen to reconcile men to this species of tax, and no tax, accordingly, is seen to excite such universal detestation. In the imposition of necessary burdens, a principle which a wise government ought never to lose sight of is, that they be as little grievous as their nature will allow to the person who is subject to them. But this barbarous tax, in addition to every bad consequence to which it leads, violates a salutary political rule, which an unjust government only will disregard.

A tax levied in kind, which, without reference to any other circumstance, requires a certain portion of the gross produce of land, is only, it is manifest, suited to a very rude state of society, and imperfect method of cultivation. In such cases, the only mode, perhaps, in which a tax can be levied on land, may be by taking a portion of the produce. In this manner was the feudal lord paid by his degraded vassals in early times, and in this manner is he still paid in some wretched countries. In this manner is the public revenue raised in those despotic states of Asia, where the will of the prince is every thing, and the rights of the people nothing.

But such a rude mode of raising a tax from land, is no more suited to the state of such a country as England, than would be a state of barter for the objects of her trade. Such a tax had no reference, and could have had none, without the gift of prescience in the lawgiver, to the state of society which now exists,—to the outlay of capital on land with the view to a future and distant return, which is the distinction and excellence of modern agriculture. The tithe has thus outlived the barbarous times in which alone it could be tolerable. The feeling which made it a religious duty, has now passed for ever away. It is not of the nature of taxes which time and habit will reconcile men to. The more society advances, the less will it be found suited to the altered state of things. The more men become possessed of property, the more grievous must such a burden be regarded, and the more grievous does it in reality become.

But we are assured by the advocates of the Church of England, that this burden, so greatly opposed to public feeling, and so universally complained of as a nuisance, is a burden

neither upon the country, the landholder, nor the farmer. The title we have seen of one of the last works produced in support of this revolting system is, "The Revenues of the Church of England not a Burden upon the Public *." The tithe, we must believe, is a burden upon no one. It does not affect the consumer, because it does not raise the price of produce. It does not affect the landholder, because he purchased or inherited his land subject to the burden. It does not affect the farmer, because he made a computation and allowance for its existence, when he entered into engagements with his landlord.

We ask, and let the common sense of every unbiassed man answer the question, Is not that a burden upon the public which restrains the exercise of industry in the first and most necessary of all the arts? What more important to a nation than the cultivation of the public territory? Are we to be told that a tax which renders it necessary or expedient to keep a large part of a populous country uncultivated, and which diverts or retards the flow of capital towards an object so national and beneficial as the fertilization of the earth, is not a burden upon the public? Adam Smith has termed the tithe a destructive tax: and who that will look beyond the narrow circle of his own prejudices will not condemn it?

Every one knows that corn is produced by the application of capital to land, and every one should know, that the fewer the charges are to which capital is subjected in the production of commodities, the more cheaply may those commodities be produced and sold. Can it be that a tax, which forms an increasing charge upon every increased expenditure of capital, does not enhance the cost of the commodities which that capital is employed to produce?

It is argued that the effect of such a tax is merely to reduce rent: True, it will reduce rent; but its effect is also to reduce production. Some eminent writers have endeavoured to show

* We regret that we have had occasion to refer to this pamphlet only that we might contradict it. The work is a warm defence of the property of the Church of England: it is written with good taste and good temper; and the greatest fault that we can find with the ingenious and learned author, as an advocate, is, that, in pleading the cause of the Church, he should have deemed it in the slightest degree necessary to mingle up the untenable case of the obnoxious and disgraceful manner in which it is supported.

that it would fall upon the consumer, even though no rent were paid to the landlord at all. Without insisting upon this ingenious argument, every one is familiar with the effects of a diminution of supply upon the market price of goods. Now, can we suppose that a tax which diminishes the means of supply, does not diminish the supply itself? This tax does diminish the means of supply, does therefore diminish the supply, and is therefore a burden upon the consumer and the country.

And with respect to the assertion that the tithe is not injurious to the landholder, we ask, Is not the landholder a member of the community? If the laws impose a tax upon his property, has he not a right to demand that the tax shall be charged and levied in the manner least hurtful to that property? If the tithe tends to prevent the full improvement and most advantageous cultivation of his land, has he not a right to complain of the tithe as an evil? He has received his land as an inheritance subject to this burden, or he has purchased it at a smaller price, because it was subject to this burden; but is he therefore precluded from seeking an alleviation of the burden itself, in so far as the laws can afford a remedy? Every evil is an injustice, which the power of the laws can without injustice take away.

But then, with respect to the farmer, we are told, that he has no *right* to complain. He took his farm subject to the burden of the tithe, and made his calculation of rent accordingly. And does not every man who employs his capital in any business, subject, by existing laws, to burdens and restraints of any kind, make similar calculations—a person, for example, who purchases the good will of a business? But is such a person, therefore, debarred from claiming that those burdens and restraints shall be removed, or so regulated as not to injure and oppress him? Is it not one of the duties of Government to remove unnecessary restraints upon industry, and to redress the grievances which private men endure?

But then, we are assured, that, if the tithe is removed, the landlord will claim, and the farmer will find it necessary to pay, a higher rent, when he enters into new engagements with his landlord. And what then? The farmer will do so, and readily, that he may be freed from an odious and injurious tax, which

interferes with all his labours, and prevents him from employing his funds freely on his own business: no class, we may be assured, feel more constantly the evils of the tithing system than that of the farmer, and none would more regard its extinction as a blessing.

But what class, in any way subject to this impost, does not feel it? The details of the laws of tithes, the cases, the interminable questions, the conflicting decisions to which they have given birth, fill volumes. Regulations, strict, harsh, and often contradictory, harass the husbandman in all his proceedings. His corn, his hay, his green grass, his vetches, his turnips, his potatoes, and the various produce of his land, must be *set out*, as it is termed, after a certain fashion, determined by statute, usage, or the decisions of courts. Minute and often frivolous distinctions are drawn, as to the cases in which certain of his commodities are subject to tithe, and those in which they may be exempted from tithe. His clover-seeds, his rape-seeds, his wool, his lambs, his milk, his garden stuffs, his pigs, his bees, his copse, nay, his broom, his furze, and his heath, are the subjects of specific regulations. If he makes his broom into bavins, the law says it is subject to tithe. If he makes his furze into pens for his sheep, it is not titheable, unless he employs it in another parish! His milk has been the subject of a thousand decisions. It has been decided that the tenth part shall be paid to the parson; but whether this shall be the whole tenth meal's milk every morning, or the whole tenth meal's milk every evening, or the milk of every tenth day, or the tenth of every day's milk, has been matter of long and learned debate. Pigs, as is well known, have been fruitful of law. Poultry and eggs have been productive of endless debate. Hens, geese and ducks, we are told, are subject to the claim of tithe, either by a tenth part of their eggs, or by a tenth part of their young; but whether the young or the eggs, has been frequent matter of great dispute. Wild fowls, it seems, are exempted, as being *fera natura*; but long and learned have been the questions respecting what fowls are tame and what are wild. A stout claim has been made for the turkeys, on the ground of their former wild habits, and their late introduction amongst us. We believe the question has not been yet fully resolved. Whe-

ther partridges with clipped wings, are tame or wild; has been a more puzzling matter, but has been decided, we believe, in favour of their being wild; because, say the law authorities, if their wings were not clipped, they would fly away. If sheep die of the rot, it has been determined that they are subject to tithe. If apples fall from the tree, a tithe is due upon those that fall. Certain kinds of wood, if they reach a certain age, are not titheable: if, when cut down, branches spring from the roots, they are titheable. It has been matter of grave debate, whether the bark of trees is titheable. It has been determined, we believe, in the negative, for what sage reason we know not; but it has been decided, that mast and acorns must pay, because they are of annual increase, except when the acorns fall from the trees, and are eaten by the owner's pigs!

Such is the system, and such are the laws, to which thousands of industrious men in England are doomed to submit, and which they can only avoid by fleeing to another country. Nor is it only the wealthier farmer and more substantial yeoman that is subject to this oppression: it extends to the domestic productions of the cottager, and brings discord and suffering to his humble dwelling.

And what is the effect of this system, so unworthy of institutions that can be termed just and wise, with respect to the Church for whose benefit it is tolerated? Witness the unhappy feuds, the interminable litigation, of which it is the fruitful parent. Is it not the source of more bitter irritation than any tax which the wants of the state impose? Who that has known a clergyman exact his tithes in the way which the law allows, does not know that quarrels and ill neighbourhood ensue as surely as the sun goes down? And what else can be the result of a system which mixes the clergyman with temporal matters inconsistent with his sacred office, and places his interests and those of his parish in real or seeming opposition? The Church of England abounds with the worst characters. More humane and excellent men exist in no country and in no rank of life. Numbers of clergymen, rather than undergo the odium which the exacting of their legal right produces, will submit to any sacrifice, and make any practicable compromise. But such is the inherent vice of the system,

that all this forbearance will not avail to correct it. Even when tithe is compounded for, it is paid with a grudge; and if one out of many clergymen exacts his full due, and in kind, the reproach spreads, and attaches to the whole system. A clergyman who chooses to demand his legal right, and succeeds to a parish where a milder system had prevailed before, undoes at once all the good that his predecessor had wrought.

But so manifest are the results of this frightful system in every corner of the kingdom where it exists, that it is marvellous that the clergy themselves should not be, of all men, the most zealous to urge a commutation. Those amongst them who are just and moderate, should wish to be freed from the reproach which the more selfish conduct of others may bring upon their order; while all should desire to be relieved from the frauds that are now constantly practised upon them, and to possess a property that is secured, instead of one that is got with so much ill-will and uncertainty.

If strife takes place between a pastor and his flock, half the good of his ministry must be lost. The hatred will be transferred from the man to the church, and the doctrines which he teaches will be disregarded. If a poor man has been wronged, or fancies himself to have been wronged, by a churchman, what doctrine is he likely to teach to his family, and in what reverence to the establishment are they likely to be educated? We repeat, nothing has more contributed to alienate the feelings of the country from the Church of England than the unhappy manner in which the provision for the clergy is raised.

In Scotland, and the protestant cantons of Switzerland—in Holland, and in the states of Germany, where a salary is paid to the clergyman, or where the tithe has been changed into a modus, nothing can occur, with respect to the temporal demands of the pastor, to disturb the relations which exist between him and his people. And, surely, it should be the policy of the Church of England to abandon claims to which the whole feelings of the country are opposed. It were a grievous misreading of the signs of the times to fancy that we shall best preserve the existing institutions of the country by supporting the evil parts of them. To give stability to our establishments,

the true policy is to remove, and not to support, abuses and evils. Let the clergy of England consider what a too pertinacious adherence to antiquated rights has wrought, in other cases similar to their own. Within the memory of thousands of the living generation, the church of France stood as secure in the support of the civil power, and more perhaps in the feelings of the people, than the Church of England now stands. It fell under the weight of those rights and privileges which itself deemed unalienable and sacred. No human power will ever rear up this fallen fabric again. Among all the evils of the ancient régime, the tithe, the hated *dixmes*, was singled out for public vengeance. This detested impost yet lives in the memory of the peasantry of France, as if it had been exacted yesterday.

However we may venerate the established church of this land—however we may esteem the many worthy men with which it abounds, we must remember that there is no national church which has less support from unanimity of public feeling than that of England and Ireland. In no other country are the dissenters from the recognised church so numerous. In the one country, the members of the church are a mere majority; in the other, the dissentients are supposed to be as seven to one. With this extraordinary anomaly—with the attention of so many now clearly fixed upon the evils, real or supposed, of the establishment—alive to those palpable abuses in its constitution which no sophistry can palliate—its sinecures, its pluralities, its overgrown endowments, its starving curates—we must see how unstable the foundation is upon which the mere abuses of the system rest. It were too much to calculate that one generation more will submit to ~~those~~ defects in the institutions of the church of England to which we have submitted. Those who succeed to us, we may believe, will only respect the laws and institutions under which we have been contented to live, if the institutions themselves shall be wise and good. In adhering to imaginary rights which the feelings of the country will not acknowledge, and in opposing changes which the spirit of the times and the interests of the community demand, the church is doing more to weaken its influence than all its open enemies can do.

It is argued, and we conceive most justly argued, that many benefits result from an established church. It affords to the

community the services of a number of well educated men dispersed over the country, and settled in the remotest districts, and who, regarding them merely as country gentlemen, may be supposed to be at least equal to the best educated and most moral individuals of that class. It affords the advantage of having numbers of the youth of the country brought up to science and polite letters, with the prospect of an honourable preferment, opening an avenue, as it were, between the different orders of the commonwealth. Generally speaking, the clergyman must regard himself as bound by the duties of his office to inculcate truths beneficial to man, to teach to others the duties of life, and to deter or dissuade from vice: he must feel that his province is to inculcate good will amongst those around him, to counsel ignorance, relieve affliction, and perform, in short, the kindest duties of a citizen, a clergyman, and a gentleman. "In retired parishes," says a writer in the *Edinburgh Review*, and this authority has been the more quoted, as coming from a quarter not supposed to be too favourable to institutions of this kind,—“In retired parishes, the family of the clergyman is often a little centre of civilization, from which gleams of refinement of manners, of neatness, of taste, as well as of science and general literature, are diffused through districts into which they would otherwise never penetrate.” “An established church is an essential portion of a constitutional monarchy. Its endowment is the property of the people. When they pillage the altar, they rob themselves. We should open as many paths as possible between the lower and upper orders of society. Every advocate of popular liberty ought to cherish an ecclesiastical institution, by which the son of the peasant may acquire unchallenged rank and independence.”

These remarks are made with equal good taste and good feeling. But every similar argument here and elsewhere employed is an argument for placing the church which the state upholds in harmony with the wants, the interests, and the happiness of the people. If we desire the permanence of an establishment which may produce the effects here ascribed to it, we should hasten to remove every cause which may lessen its influence, or alienate from it the support of reasonable men.

It is argued, and very eagerly argued, that it can matter no-

thing to the nation, whether a portion of the revenues of land shall be in the possession of clerical or of lay proprietors. "Let any person," says one of the warmest and most eloquent partizans of things as they are, "in the middle ranks of life, who knows any thing of his ancestry for two or three generations, ask himself, what benefit they have derived, and he himself in consequence, from so much of the church property as may have fallen to their portion in its service; and then let him calculate whether he and they would have been gainers, even in their low pounds-shillings-and-pence point of view, if there had been no such charge upon the land as that of tithes. Let any parent who has a diligent and hopeful son at school or at college, ask himself whether the youth's chance in life would be as good as it is, if the church lands were secularized, if tithes were abolished, and the clergy left, like the dissenting ministers, to depend upon their congregations? And if we had Dukes of Durham and Winchester, instead of Bishops, would the lands attached to the title be more productive, or the tenants sit at easier rents? Should it not, on the other hand, seem as evident as it is certain, that every one is interested in upholding an establishment, by means of which some of the public wealth is set apart to be disposed of, not by the accidents of birth, but among those who may deserve it by their learning, their abilities, and their character; and that, too, under the notorious condition, that, without character, neither learning nor abilities will be regarded as a claim?—a distribution whereby no man has been, is, or can be injured; while some scores of individuals, in every generation, are raised by it to stations of dignity, and some hundreds of families placed in respectability and comfort. And yet the wealth of the church, which, when thus regarded, might be thought necessarily to secure it, by connecting its preservation with the plain and tangible interest of every household, from the highest to the lowest, is, on the contrary, a cause of danger at this time, because men will not thus reasonably regard it. Already voices are heard in Parliament recommending a second spoliation * !"

We at least are not amongst those who recommend a second spoliation; nor do we call for Dukes, in place of Bishops, of

* Colloquies on the Progress and Prospects of Society.

Winchester and Durham. We have Dukes enough ; and with regard to Bishops, we shall only observe, that their revenues perhaps might be somewhat better apportioned amongst the members of their own order. One of the dignitaries here spoken of enjoys an income exceeding, we believe, £ 25,000 a-year, a sum which would maintain 50 teachers of the Gospel, hold out 50 prizes to 50 diligent and hopeful sons, and place 50 families in respectability and comfort. We leave it to Mr Southey himself to judge which alternative, upon his own showing, would produce the most of private good and public happiness. But this is foreign to our purpose. We are not now to quarrel with the reasoning, erroneous as we conceive it to be, of the learned and amiable writer, but to claim every argument he uses in support of the opinions which we, in common with the great majority of his countrymen, entertain. We argue not for the plunder of the church establishment, but for providing for its support by means which the judgment of men may approve. We argue for the removal of a system of rapacity and injustice, which had its establishment in an age of monks and barbarians,—which was matured during long ages of darkness and imposture,—which is no longer suited to the temper of the times, or the interests of the country,—which makes tax-gatherers of a Protestant clergy, and which thus, while it oppresses the people, degrades their teachers.

A tax in kind, levied by the persons who are maintained by it, is in nothing like the inheritance of property, of which Mr Southey speaks. The possession of property of any kind is very different from the possession of a power to levy a tax upon property. If a clergyman possesses an estate in land, he is in this respect in the situation of a secular proprietor. In some respects, it can matter nothing to the nation whether the revenue derived from land be enjoyed by a lay proprietor or by a clergyman ; and in other respects, the advantage will be in favour of the latter, as being always well educated, and for the most part more moral and observant of decency, not to speak of religious duties, than most other men. The clergyman, indeed, is but a tenant for life of the property whose revenue he draws, which certainly is not the best mode for the public interest in which property in land can be inherited or held. But the clerical holder would be nearly in the same situation as the owners of estates

held under strict entail ; and this, though it would not perhaps be the best, would still be a better mode, under certain limitations, of supporting the members of the church, than by allowing them to support themselves by a tax upon the property of others. Adam Smith has drawn a distinction between these two species of church provision. The one lessens the resources of the state, inasmuch as the more of the net produce of land is given to the church, the less of it will be available for the service of the state. But when we make a clergyman a proprietor of land, and subject him to the same duties with respect to the public contributions as any other proprietor, we merely substitute a clerical for a lay proprietor. The argument, therefore, which Mr Southey here uses, and which he fortifies by quotations from Burke, are not in favour of tithe, but of a conversion of tithe into real property. We need not here inquire whether it would be expedient to convert more of the land of the country into mortmain. Our opinion is that it would not, and that a tax on land would be greatly preferable to that species of endowment.

Many have suggested a conversion of the tithe into a proportion of the rent, in which case it would become a tax on rent, and rise or fall with the value of the land. To the principle of this mode of commutation, we can see no material objection ; at the same time, we should prefer, as the more simple and satisfactory mode, a conversion into a permanent land-tax, the least injurious and least burdensome species of impost that can be levied upon land. And, in order to obviate every objection, on the part of the tithe-owner, we should propose that this tax should be fixed in grain, as at so many bushels, or so many quarters, the price of which, to be determined in a specified mode, should be paid in lieu of tithe. In Scotland, the simple expedient of converting the tithe into a land-tax was resorted to and carried into effect with the greatest facility. The tithe was commuted, on the requisition of the payer, at a certain proportion of the rent, or value of the land at the time, and this being fixed, was permanently fixed and subject to no further change than what should arise from the varying price of corn. To this most wise and happy law, Scotland owes its agricultural prosperity. Had a tithe, like that of England, been levied on so poor a country, a great part of the surface now cultivated,

must have remained to this hour a desert. Those prodigious improvements which have taken place under all the disadvantages of climate, soil, and situation, could most of them never have been attempted had the produce been subject to the impost of a tenth part. Well, indeed, may the Scotch revere that indomitable courage of their ancestors which resisted with their blood the arbitrary imposition of a church establishment unsuited to the state of the country, and in opposition to the will of the people.

The details of such a plan, we conceive, would be extremely simple, and attended with infinitely fewer practical difficulties than have been too long conjured up by the fears of the payers of tithes on the one hand, and the interested pretensions of the receivers of them on the other. Commissioners, or arbitrators, being appointed in each parish, they should be empowered to determine, upon evidence, the rate or amount at which each individual owner of titheable property should be entitled to convert his tithe. This being done, each owner of titheable property should have the power to convert his tithe; and the conversion being once made, should be permanent. In this manner, every owner of titheable property in the kingdom would have the power to commute the tithe in kind, into a fixed and permanent payment, which would be subject to no further change than what would arise from the varying price of the produce of land. The conversion of the tithe would thus take place throughout the whole kingdom, in proportion as the payer of the tithe found it practicable or expedient to make the exchange. The change would thus be effected without violence or injustice to any one, while the interests of both payer and receiver would be secured in case of a rise or fall in the value of produce. It would not be necessary that the payment of money in lieu of the tithes should be fixed every year according to the price of grain. If this were done every seventh year, upon an average of the seven preceding years, every purpose of security would be served to either party.

The lay proprietors of tithes should, it is manifest, be placed in the same situation as the clerical proprietors. No lay proprietor can have just cause to complain, if he receives a fair equivalent for this species of property. The legislature has an

undoubted right (and it is its bounden duty to exercise that right, when the public interests demand it), to exchange any species of property for an equivalent. This right is exercised in every session of Parliament, in the case of roads, canals, bridges, streets, and all public works. How much more is it the duty of Parliament to exercise this power in the case of a property like tithe, which is merely a tax which private men have the power of levying upon the industry and property of the country.

Every argument that can be urged for a commutation of this pernicious burden in England, applies with a tenfold force to Ireland, where we find the anomaly of a church maintained by the state, in opposition to the will of the great mass of the people. The measure lately introduced for commuting the tithe of that country, and with which it is with regret that we couple the name of Mr Goulburn, is a paltry and insufficient palliative, which fails entirely to reach and redress the grievance of the tithing system. It finds, indeed, its advocates in Parliament, as what absurdity may not. It has been said by its advocates there, that it *works well*. It should rather be said that the tithing system works ill, since men are glad to receive such a substitute. The tithe law of Ireland is an entire reproach to the civil power that permits its existence. There is nothing surpassing it in extravagance and injustice in any country in Europe. The whole law is opposed to the feelings of the people, and tends to perpetuate the religious bigotry and intolerance which have been the bane of that unhappy country time out of mind.

The population of Ireland is understood to be upwards of seven millions, of which, upon the largest calculation, about 1,270,000 are members, or professing members, of the national church. To accommodate this number, there are 1155 churches, supposed to be capable of holding about 200,000 persons. To take care of this flock, there are 4 archbishops, 18 bishops, 33 deans, and 34 archdeacons. Of the holders of benefices, amounting to 1273, 390 are non-residents. In several of the parishes there is no public duty to perform, there being no church in which to perform it. Of the resident clergy, some reside without doing any duty, and others betake themselves to any other occupation rather than that of preaching. These, and

other astounding statements, were recently made, in his place, by a Peer of Parliament. They were listened to in silence, and a motion even for an inquiry did not meet the support of a single voice !

To keep up this frightful system, an entire country is subjected to a tax abhorrent to the people. In some of the parishes, the Roman Catholics are to the Protestants as 80 to 1. In addition to the grievance of tithe, this minority has the power, by law, of assessing the majority to any extent, for building, enlarging, and repairing churches ; nay, for organs, bellows-blowers, bell-ringers, and the like. The majority has not even a vote, whatever may be its property or numbers. We have heard of taxation without representation. Here we have it, and in a form calculated to speak to the reason as well as the passions, of the sufferers. To support a system like this, we are contented to endure, that a third part of the inhabitants of the British islands shall be kept in a state little short of civil war.

Every artifice of special pleading is resorted to for the purpose of justifying this cruel abuse of legislative power. We are told that the principal part of the property of Ireland being in the hands of Protestants, the tithe is principally paid by Protestants, that it is chiefly paid to clergymen who reside in the country and spend their income in it, and that it is better that it should be so, than paid to absentee proprietors. A child may furnish the answer. The tithe is a grievance, not merely as a payment in money, but as a rude and unjust mode of levying a tax upon the people. Roman Catholics must, of necessity, be occupiers of land as well as Protestants, if they are to dwell in the country at all ; and they cannot escape, except by abandoning their country, an impost from which the humblest peasant is not freed.

That it is better that a portion of the revenue of land shall be paid to a resident clergyman than to an absentee proprietor, is a proposition, which, if conceded, does not bear upon the question. The question is not, whether the revenue of tithe should be spent in the country ? but, whether the tithe is the best mode of giving a portion of the produce of the land of the country to support the clergy ?

Further, it is not true that the clergy are all residents; nor if they were, would it follow that the best mode of expending the tithe is in support of 4 archbishops, 18 bishops, 33 deans, 34 archdeacons, and 390 non-residing clergymen. If this fund were expended by the state on works beneficial to the country, it would equally, if not more advantageously, employ the labourers of Ireland. Or, if we will have resident gentlemen, there is a class of them whom we would recommend to especial notice. These are *schoolmasters*, whose labours might usefully supplant even those of the four archbishops. If we are not misinformed, the revenue of a single see, that of Armagh, would support a schoolmaster in each of half the parishes of Ireland.

Were we to argue that a portion of these extravagant endowments would be happily employed in paying salaries to the Roman Catholic clergy, we suppose we should be accused of little short of heresy, and of aiming at the downfall of the church. Yet, and with a feeling as warm towards the Protestant establishments of this country, as their unthinking advocates, we do assert, that to pay the clergy of the Catholic population,—to free the poor peasantry of Ireland from the burden of supporting their religious teachers,—would be an act of wisdom, humanity, and true policy, which would more redound to the happiness and glory of the country than the existence of a thousand clerical sinecures. While such a measure would relieve the peasantry of the country from a burden which they can ill support, it would at once attach their clergy to the state by the tie of interest; it would at once enlist them on the side of the civil power, instead of their being identified, as now, with the wrongs and feelings of the people whom they teach. The Protestant Church of Ireland, with all its rich endowments, does not make a single convert: while the poor Catholic Church is able to gain proselytes, and preserve the ascendancy of a faith, which, in all other countries where public opinion is free, is gradually giving way, and losing its characteristic features.

But, again, the existence of the tithing-system in Ireland does not make a greater number of residents in that country. Its tendency and effect are altogether the reverse. Its operation is to drive capital from the land, and to contribute to that dis-

tracted state of society which makes thousands of Irishmen, of either faith, prefer every country to their own.

But, upon this whole subject of tithes, public feeling in England is now at length awake. Various petitions were presented to Parliament, in the course of last session, by large bodies of land-owners, farmers, and magistrates. One from the county of Devon deserves attention. The petition was resolved on at a general meeting of that county, and all the petitioners were either owners of land, or payers or receivers of tithe. They stated that they approached the House under a firm conviction, that the existing laws were injurious to religion, as destroying the harmony and confidence that ought to subsist between pastors and their people; that the system was inconvenient, not to say hurtful, to agriculture; constituting a great bar to improvement; preventing a fair return on capital so expended, and, consequently, checking the appropriation of unemployed capital to the reclaiming of waste lands. They entreated the attention of Parliament to the subject, and prayed "that the House, after due consideration, would be pleased to adopt such measures as might appear just, to the payer and receiver of tithes, and beneficial to the interests of religion and the country." This is the language of reasonable men, and if the Parliament of England represented very truly the public feeling, such prayers would not be urged in vain.

There is one way, indeed, in which the progress of public opinion on this important question may be impeded or diverted. This is by the introduction of some temporizing expedient, which, without reaching to the root of the evil, may render it, or seem to render it, a little more tolerable. We know not whether this be the policy now in progress. But if a tub is to be thrown to the whale, it shall not be our fault if the whale amuses itself with a tub. It is to warn the landowner, the farmer, and the consumer, against such an attempt that we have introduced at so much length the often agitated question of tithes; and that we now call attention to the extraordinary bill which we have quoted in our title.

The Archbishop of Canterbury, who has suffered himself to be made the organ of announcing this unhappy plan, introduces it to Parliament in the following terms:—"We have

heard," says his Grace, "many objections raised to the way in which the incumbents of benefices are at present provided for. It is, in the first instance, said that this mode of provision tends to destroy that harmony which should always subsist between the pastor and his parishioners; and, in the second place, it is asserted by the farmer, and, I believe, with some reason too, that he is prevented by it from employing his capital as he would be enabled to do if some settled arrangement were adopted, and he was not left subject to the uncertainty to which he is exposed under the existing system. For this evil different remedies have been proposed; the substitution of a fixed money-rate, of a corn-rent, and other modes of payment, have been suggested; but to all these measures I object, on the principle that they tend to a total extinction of the tithe."

And would not the reason here assigned for refusing to accept of a fixed money-rent, a corn-rent, or any of the other modes of payment suggested, be the best reason to the country for resorting to them, namely, that they would lead to a total extinction of the tithe? We can scarcely think that twelve impartial men in England, out of the pale of the church, would, upon their oaths, not pronounce the total extinction of the tithe to be a blessing. Is the Church of England so enamoured of this hated name, that they will refuse to accept in place of it such a just equivalent as the wisdom of the laws shall offer, and the public interests shall demand? But let us examine the boon which the Church of England now offers to the prayers of the country, as the substitute, or the remedy, for this dreadful tax. Will not the enemies of the church quote it as the proof that corporations never reform themselves,—that the spirit of churchmen, possessed of power, is the same in every age?

The bill proposes to provide as follows:—

When the *patron* of any living, the incumbent, and the owners of two-thirds in value of the titheable lands, shall desire a composition, they shall present a petition to the Archbishop or Bishop within whose benefice the lands lie, setting forth the circumstances of the case, and praying such Archbishop or Bishop to *permit them to proceed in making such composition!*

Then it shall be lawful for the said Archbishop or Bishop to

require such particulars, or information, having reference to the object of the said petition, as to the said Archbishop or Bishop shall seem necessary or proper. And then the said Archbishop or Bishop may issue a letter of inquiry, addressed to any such person or persons as he shall think proper for that purpose, requesting or directing him or them *to inquire into the expediency of allowing the object of the said petitioners to be carried into effect!*

Then, in case the said Archbishop or Bishop shall be satisfied that the requisitions of this act, up to the time of presenting the said petition, have been duly complied with, and that *there is reasonable ground for expecting that benefit will be derived from allowing the objects of the said petition to be carried into effect*, the said Archbishop or Bishop shall signify his assent to the same, and he shall direct the rector, vicar, or other incumbent, to fix a time and place at which a meeting may be held of all the persons whose tenements are subject to tithes, or other variable payment, for the purpose of electing another commissioner for carrying the objects of the said petition into effect, jointly with the commissioner appointed by the said Archbishop or Bishop!

But if the said Archbishop or Bishop shall omit, for the space of 60 days, to transmit to the rector, vicar, or other incumbent, his assent to the said petition, it shall be lawful for the rector, vicar, or other incumbent, or for the patron, or for any person being an owner of the titheable lands, to *request the said Archbishop or Bishop to declare his decision with respect to the said petition!!*

And if the said Archbishop or Bishop shall omit, for the further space of 30 days, to transmit his notification of assent to the said petition, then the said Archbishop or Bishop shall be deemed *to have refused his assent to the same!!!*

Further, if no meeting shall be held by the inhabitants, or no commissioner elected by the meeting when it is held, then the *Lord-Lieutenant of the county*, upon the requisition of the said Archbishop or Bishop, shall appoint a commissioner to act jointly with the commissioner appointed by the said Archbishop or Bishop!

Then the commissioners may appoint a clerk, employ sur-

veyors, agents and servants, pay them reasonable salaries, allowances, wages, remuneration, order plans, surveys, admeasurements, estimates, &c. &c. and, finally, fix the net sum to be annually paid for each messuage, farm, land or tenement, to the incumbent; and this rate of assessment shall continue for 21 years, or such lesser period as shall be set forth in the petition.

The sum of money payable for each messuage, farm, land, or tenement, being fixed by award, the commissioners shall declare the average value of good marketable English wheat at the London market, for the seven years preceding the 1st day of January in the then current year.

Then, at the end of each seven years, the rector, vicar, or other incumbent, may apply to the Justices of Peace at the Quarter Sessions, to ascertain the average price of good English wheat at the London market, and the various assessments laid on by the commissioners, altered according to *the change in the price of this wheat!*

Such are the principal conditions of this project; and we need not say that the Legislature that would pass such a measure into a law, would dishonour itself. Why, we ask, is all to depend upon the will of any Archbishop or Bishop? Why is this cumbrous and costly machinery to be renewed at intervals? Why those partial provisions in favour of the receiver of tithe, and none in favour of the payer? Why are men to be compelled to put their property to the hazard of such an arrangement as this? How is the farmer to calculate the contingencies of such a complicated and uncertain settlement? Let it be supposed that he enters upon a farm during the continuance of one of these periods of composition, How is he to calculate the possible terms upon which it is to be renewed, or the contingency of its being renewed at all? How is he to expend capital on land, under circumstances of so much uncertainty and hazard? To him, it is obvious, this measure affords no safety; it is "confusion worse confounded," and leaves him in many respects in a less favourable condition than if he could see and calculate the utmost rigour of the exaction.

Such a measure, however, cannot pass. Parliament could not sanction it without a breach of trust, and an insult to public

feeling. The country demands a commutation of the tithe, and not a subterfuge and half-measure, which leaves the real evil unredressed in all its essential points. We do not design to speak with harshness or disrespect of the eminent Individual who is the medium of introducing this measure. The Archbishop of Canterbury is the organ of the church, the representative of the feelings of its members, and, by the duties of his high office, the supporter of their privileges. It were too much to suppose, that he were to be exempted from that *esprit de corps*, which, within reasonable limits, is an amiable infirmity. But the Archbishop of Canterbury has a course before him so plain and direct, that the marvel would be if he should miss it. It is not to defeat the public wishes, but to comply with them to the utmost limit of reasonable concession. In this manner he will consult the interests, the safety, and the honour of that great Establishment over which he presides,—will satisfy the just demands of the country,—and couple the redress of a great public grievance with his own name. The country, we feel assured, will not the less thankfully receive this act of long retarded justice, that it is rendered at length to the people of England by the good-will of an English Prelate.

MISCELLANEOUS NOTICES.

1. *Commerce of Great Britain.*—It is beneficial to know the relation in which the various countries of the world stand to us with respect to the value and importance of the commerce which we carry on with them. The following table, for the year from January 1828 to January 1829, and derived from an official return laid before Parliament, will show the state and value of our commerce with all countries. The first column exhibits the value of Imports for one year; the second, the value of Exports. If we are to judge of the relative value or importance of the commerce of countries by the quantity of commodities with which they supply us, we shall find this shown in the first column of the table. But if we are to judge of the value of their commerce by the quantity of our native or colonial produce which they consume, this we shall find indicated in the second column.

Countries in the order of the Value of the Imports from them into Great Britain.

1. British West Indies, . . .	L. 8,908,672
2. East Indies and China, . . .	8,348,767
3. United States of America, . . .	5,820,561
4. Russia, . . .	3,442,653
5. France, . . .	3,159,303
6. United Netherlands, . . .	1,978,110
7. Germany, . . .	1,660,366
8. Brazil, . . .	1,486,271
9. Africa, comprehending Egypt, Ports in the Mediterranean, Cape of Good Hope, Mauritius, &c.	1,175,813
10. Italy, . . .	1,064,946
11. Prussia, . . .	1,027,368
12. Spain and the Canaries, . . .	978,612
13. British Northern Colonies of America, . . .	839,981
14. Turkey and Continental Greece, . . .	731,943
15. Portugal, Azores, and Madeira, . . .	584,818
16. South American Republics, . . .	535,085
17. The Whale Fisheries, . . .	428,591
18. Denmark, . . .	371,929
19. Isles—Guernsey, Jersey, Alderney, and Man, . . .	316,515
20. Foreign West Indies, . . .	185,011
21. Sweden, . . .	146,181
22. Ionian Islands, . . .	143,592
23. New South Wales, &c. . .	84,812
24. Norway, . . .	69,897
25. Gibraltar, . . .	29,768
26. Malta, . . .	16,329
27. Morea and Greek Islands, . . .	260
Total Imports, . . .	L. 43,536,187

Countries in the order of the Value of the Exports to them from Great Britain.

1. Germany, . . .	L. 9,467,093
2. United States of America, . . .	6,843,727
3. East Indies and China, . . .	6,388,330
4. Brazil, . . .	6,155,791
5. United Netherlands, . . .	4,266,116
6. Italy, . . .	4,642,331
7. British West Indies, . . .	4,049,656
8. South American Republics, . . .	3,287,212
9. Russia, . . .	2,763,987
10. British Northern Colonies of America, . . .	2,906,914
11. Gibraltar, . . .	2,078,663
12. Portugal, Azores, and Madeira, . . .	1,764,033
13. Foreign West Indies, . . .	1,450,562
14. Africa, comprehending Egypt, Ports in the Mediterranean, Cape of Good Hope, Mauritius, &c.	1,148,828
15. Prussia, . . .	705,813
16. France, . . .	643,308
17. Malta, . . .	694,351
18. Spain and the Canaries, . . .	613,615
19. New South Wales, &c. . .	611,600
20. Turkey and Continental Greece, . . .	525,148
21. Isles—Guernsey, Jersey, Alderney, and Man, . . .	440,888
22. Denmark, . . .	267,599
23. Norway, . . .	131,665
24. Sweden, . . .	129,611
25. Ionian Islands, . . .	69,590
26. The Whale Fisheries, . . .	1,694
27. Morea and Greek Islands . . .	425
Total Exports, . . .	L. 61,948,382

2. *On a Farinaceous Aliment obtained from Straw.*—The attention of agriculturists in France has been recently directed to the discovery of a method of converting straw into a kind of bran, or *farine*, for the feeding of domestic animals. This discovery has been claimed by two individuals: the first is a miller near Dijon, of whose name we are not informed, who, it is said, on trying the millstone of a new mill, discovered the possibility of converting straw into nourishing food; the second is M. Joseph Maitre, founder of the fine agricultural establishment of Vilotte, near Chatillon. This distinguished agriculturist, known for the purity and perfection of his breeds of sheep, con-

ceived the idea of converting into *farine*, not only the straw of wheat and other grains, but of hay, trefoil, lucern, saintfoin, &c. His efforts are said to have been perfectly successful, and his discovery arrived at, not by chance, but by long experiment and research. The aliment which he has produced, is said to be a complete substitute for bran. It is given to sheep and lambs, who consume it with avidity, and may be given to all other graminivorous animals as a grateful and substantial food. M. Maltre, with the view of bringing the process to perfection, has ordered a mill for its manufacture to be erected in the midst of his large farms; and he is preparing to communicate a report to the Royal Society of Agriculture, on the advantages in rural and domestic economy to be derived from this preparation. We are not, at the present moment, informed of the nature of this process. If it be a simple grinding of the straw, or fodder, and a separation of some of its fibrous matter, we can easily imagine the advantages that may result from it. We know in this country, that the mere chopping of straw adds greatly to its nutritive powers, by facilitating mastication and digestion. We may believe that a more perfect comminution of its parts, will produce a corresponding effect, and extend very widely the uses of straw and other fodder, as a means of feeding our domestic animals.

3. *The Shell-fish termed Clams.*—The common clam, *Pecten opercularis*, which is abundant on many of our coasts, is occasionally used as an article of food, but is greatly inferior to the oyster. The great clam, *Pecten maximus*, which attains a diameter of from 6 to 8 inches, is, on the contrary, in every respect, the finest shell-fish which we possess. It occurs abundantly in many places along the western coasts of Scotland, and especially among the Hebrides, where it is occasionally eaten. The introduction of this species in places along the east coast, where it might succeed, could easily be accomplished. It is reported to have been formerly tried on the oyster banks in the Firth of Forth, where, however, it has become extinct, the only remains of it being a few dead shells which the dredges occasionally bring up.

4. *Preservation of Fruit-Trees from Hares.*—According to M. Bus, young fruit-trees may be preserved from the bites of hares, by rubbing them with fat, and especially hog's lard. Apple and pear trees thus protected, gave no signs of the attacks of these animals, though their footmarks were abundant on the snow around them.—*Bullet. Univers.*

5. *Preservation of Potatoes from Frost.*—In time of frost, the only precaution necessary is to keep the potatoes in a perfectly dark place for some days after the thaw has commenced. In America, where they are sometimes frozen as hard as stones, they rot if thawed in open day; but if thawed in darkness they lose very little of their natural odour and properties.—*Revue Industrielle.*

6. *Preparation of Sugar from Starch.*—M. Heinrich says, that from one to two parts of sulphuric acid for each 100 parts of potato starch is sufficient, if the heat applied be a few degrees above 212° Fahrenheit; and also, that then two or three hours are sufficient to give crystallizable sugar. He applies the heat in wooden vessels by means of steam.—*Quart. Journ. of Science.*

7. *Indigenous Scotch Fir.*—In the forests of Braemar, on the river Dee, there still remain numerous magnificent trees of this species. In Mar forest,

individuals are seen, which at the base have a circumference of upwards of 12 feet, and have attained a height of from 60 to 80 feet. The difficulty of conveyance greatly diminishes the value of these trees to the proprietor. They are floated down the river, during floods, to Aberdeen, a distance of 60 miles. This region seems peculiarly favourable to the development of these trees; but the long glens of the Grampians, which were formerly covered by them, are now, for the most part, destitute of wood, the period having apparently arrived, when nature has resigned to man the care of disseminating them according to his wants.

8. *Aversion of some Graminivorous Animals to particular Plants.*—Mr Blaikie of Paris mentions that he observed, this season, at Chaillot, a large field which had been long left uncultivated, but was thickly covered with natural grasses. Many large patches of fine white clover, *Trifolium repens*, were left flourishing, while the rest of the pasture-plants had been closely cropped. He found that the field had, for some years, been depastured by a great number of milch asses and goats, kept for the supply of their milk to Paris; and although these animals are not generally over-nice in feeding, yet, from some peculiar antipathy, they had left the white clover wholly untouched, while all the other pasture-plants were eaten bare. We do not recollect to have met, in any georgical work, with this remark of the aversion of the ass and goat to white clover.

9. *Protraction of Vegetable Life in a Dry State.*—At the Medico-Botanical Society, Mr Houlton produced a bulbous root, which was discovered in the hand of an Egyptian mummy, in which it probably had remained for 2000 years. It germinated on exposure to the atmosphere, and when placed in earth, grew with great rapidity.—*Medical Journal*.

10. *Nature of Earths with reference to the Growth of Plants.*—The Report of MM. Thenard and Sylvester, on a memoir upon this subject by M. J. St Hilaire, is to the following purport. The author remarks that most persons who have analyzed arable earths, have taken exclusively such as had been cultivated, and in which the original constitution had been more or less altered. He believes that the various kinds of earths in their first state have peculiar powers of nourishing particular plants; and thinks that the exact knowledge of these peculiarities would enable cultivators to put those seeds in the ground which are most suited to it. From various analyses, he draws the following inferences:—1st, That all earths are composed of silica, alumina, lime, magnesia, &c., in different proportions, together with a vegeto-animal matter, which is more abundant as the earth is more fitted for the nourishment of plants; 2dly, That plants placed in earths, of which the constituent parts have an analogy with the particular nature of the plants, do not exhaust the soil; 3dly, That a series of observations on the different species, genera, and families, which grow naturally and in great numbers, perpetuating themselves on certain soils, with the analysis of these soils, would be of great utility in agriculture. The reporters think that agriculture would draw from such labours general inductions, rather than positive directions, but still that these would possess great interest.—*Revue Encyclopedique*.

QUARTERLY AGRICULTURAL REPORT.

October 15. 1830.

THE year which is now drawing to a conclusion, must be numbered amongst those which have been calamitous to the husbandman. The season has been unfavourable to all the operations of the farm ; the fallows have not been worked with effect ; the harvest has been prolonged and expensive ; the pastures, owing to the low temperature and excess of moisture, have not fed well ; the rise in the price of grain, when it occurred, did not benefit the grower, who had no stock on hand ; and the prices of live stock have been low, and constantly declining. The only part of farm produce that has commanded a ready market, though not a high price, is wool,—the result of the diminished stock in the hands of the staplers, and the increasing activity of the woollen trade. This, however, has done nothing to compensate the reduction in the price of sheep. The same class of mountain lambs, for example, which, in the year 1819, produced 12s. and 14s. a-head, we have this year known to be sold at 2s. 8d. and 9s. ; and, although the reduction in the value of other stock, has not been in the same proportion, it has been very great, and embarrassing to the breeder.

Under these circumstances, the state of the present crop, and the prospects of the future demand, whether for corn or live stock, become of extraordinary interest to all who have a stake in the land of this country.

The crop, generally speaking, may be described as a bulky one, although with large exceptions in the case of particular districts. On the light and dry soils, it is generally fine ; in the clay land districts, it is inferior ; and on the poorer class of clays, it is for the most part very bad. The general crop in the south of the Island seems to be better than in the north ; and, what could scarcely have been anticipated in so moist a season, it is in many cases better on the west coast than on the east. The samples of wheat that have yet come to market are generally coarse, damp, and inferior, and the complaints are general that it does not yield in proportion to the bulk of straw. The barley is generally good in produce, but the quality is very various. In Scotland, what has yet appeared is coarse, and lighter than that of last year ; while that which has been brought from Norfolk and Suffolk is very fine in quality. Oats are, generally speaking, a good crop ; pease will probably not exceed half the produce of a favourable season ; and

beans, though bulky in the straw, are not productive. Potatoes are defective in Scotland, but better in England. In Ireland it is doubtful whether they are a good crop. Turnips are generally bad, and in many cases a total failure. Upon the whole the result of our inquiries and observation is, that the crop of the kingdom will hardly reach what is termed an average.

The range of prices must depend on too many contingencies, to allow us to draw conclusions upon the subject with any certainty. Upon the whole, we are not led to anticipate low prices for the produce of the present crop. We found our expectations upon the following circumstances:—1st, The low state of the stocks in the country, notwithstanding of the large importation of foreign corn; 2d, The demand in some of the continental countries, as Holland, and the unfavourable state of the harvest in the north of Europe; and, 3d, The improvement in the state of the manufacturing population of this country.

One circumstance indeed there is, connected with the condition of the growers themselves, which may operate with material effect in depressing the markets, and to which we are desirous of calling the especial attention of landholders and farmers. This circumstance is, the precipitate thrashing out of the crop by the farmer during the early part of the season, with the view of providing for present necessities, and meeting the engagements to the landlord. The effect of this upon the market has been fully shown in the state of the corn trade of the present year. The market was depressed in the early part of the season by the overabundant supplies, which the necessities of the farmers induced, or compelled them to bring forward; while, when the advance of price did take place, it was when the farmer's stock was exhausted, and when it did not benefit the grower, but the foreign importer and the speculator in corn.

The best preventive for this, that we can think of, is, 1st, to apprise the agriculturists of the opinions entertained by those most conversant with the prospects of the corn trade, regarding the probable state of prices during the ensuing season, so that farmers may not be led by unnecessary fears to force forward their supplies too early to market; and, 2d, to impress upon landholders the wisdom and expediency, of not pressing with precipitation or severity upon their distressed tenants for the fulfilment of present engagements. The management of a great part of the landed property of this country, must of necessity be in the hands of many, who cannot, in all cases, be supposed to be perfectly aware of the actual state of the tenants,

and of the importance of allowing them time and opportunity in this season of difficulty, to bring their produce to market at the most suitable period. This, however, is a forbearance which land-agents, in every part of the kingdom, should consider as due to the honour of their employers, the private interests of the farmers, and the general interests of agriculture.

The state of the corn trade for the last three months has excited much attention. In our last Report, we detailed the circumstances which would probably tend to raise the prices, previous to the new crop, to such a state, as to admit the foreign corn then in bond at a low or nominal duty. Soon after the middle of July, accordingly, the prices of wheat rose rapidly, so that the duty on foreign wheat, which was then 20/8 per quarter, fell towards the middle of August to 2/8; at which rate it remained for three weeks, when all the grain then in warehouse was entered for home consumption. After this, the fall on the averages was as rapid as the rise, and the duty at present payable is 24/8.

This rapid increase and fall has given rise to much discussion and diversity of opinion amongst those interested in agricultural affairs. Some have expressed suspicion of frauds in the returns of the corn averages; and an attempt of this kind from a certain town in England, in the case of rye, has appeared to give some confirmation to this opinion, in which, however, we do not concur. We conceive that there are circumstances that have given to capitalists, in the present year, the power of influencing, in an unusual degree, the markets, and consequently the returns, without the necessity of resorting to the supposition of a falsification of these returns. First, The supplies of home corn in the country were unusually low, and these being mostly in the hands of merchants, gave a great power to the operation of capitalists upon the corn markets. Second, The rise produced was in part occasioned by the retardation of harvest, and the alarming state of the weather at its commencement. And, with regard to the sudden fall which immediately ensued, that may be accounted for, in part, by a circumstance which is of yearly occurrence, namely, the introduction of the damp and inferior corn of the new crop; though doubtless also, it may be ascribed, in part, to this, that the object of the capitalists being attained by the liberation of the foreign corn, their interest was now to operate on the markets, to reduce them, with the view of checking further importation. In the conclusion, however, which has been drawn from these circumstances, we entirely concur, namely, that the corn law is in this respect defective,—that it can be so readily made the engine of speculation and private gain,

without yielding any advantage to the consumer. It is manifest, that the grain thus released at a nominal duty, could have paid a large duty, and could thus have been a source of revenue to the country, without affecting the price at which it would be sold in the market. This circumstance, it is said, has attracted the serious attention of Government ; and a pretty general opinion exists amongst those interested in the corn trade, that a change in the law is contemplated. This we shall not be surprised at, nor shall we, in any degree, regret it, in so far as it may affect the landed interests. That the present law is defective, in some essential points, is proved by its effects. It is seen to encourage speculation more than it protects agriculture, and to fail as a source of revenue, without being on that account more beneficial to the consumers. We are prepared to recur to this important question in our next Number, when we will endeavour to show that the effects of this, and indeed of any corn law, have been greatly over-rated ; that a moderate fixed duty would compensate to the grower the protection afforded to him by the present system ; would be more in harmony with the public feeling ; would, instead of rendering the corn law, as now, a source of odium and complaint, enlist the public interest in support of it, inasmuch as it would then be rendered a source of beneficial revenue to the country. We are prepared to show, that this law places the agriculturists, without the least necessity, in what may be termed a *false position* with relation to the other classes of the community.

We have said that one of the sources of our hope that no diminution will take place in the present value of corn, and we may add, of farm produce of any kind, is the improved state of the manufacturing population. Whenever occasion has offered we have endeavoured to illustrate the connexion existing between the prosperity of the landed classes, and that of the general trade of the country, and above all with the condition of the great mass of the consumers. This is a relation between the interests of the two classes which all the efforts of a shallow and a selfish policy would be insufficient to dissolve. With the interest of the consumers, that of producers is inseparably combined ; and far beyond the effects of all the corn laws which the artifice of legislation can devise, is the influence of consumption upon that which is to be consumed. When we consider the nature and effects of the commercial panic of 1826, the most calamitous that ever took place in this country ; and when we add to that the effects of four deficient harvests in succession, we need not wonder that the aggregate means of the whole community should have been greatly counteracted and disordered : But that the effect of this state of things, has been to diminish domestic consumption to an enormous extent, we are not left to inference alone. We have unfortu-

nately proofs, numerous and melancholy, in the recent sufferings of the people.—But we think that, without hazarding rash anticipations, we may say that the prospects of the manufacturers of the country are favourable and improving. We will not refer to the evidences of this fact, in circumstances connected with the general trade of the country, to which, notwithstanding a thousand false and idle tales of decaying trade, we could refer*, but to a circumstance, from which an entirely opposite inference has been recently drawn—the state of the revenue. We hear it every where said, that for the last two quarters, the revenue has continued progressively to decline, manifesting increased distress, and diminution of consumption. We assert, on the contrary, that the present state of the revenue is favourable, and marks the progressive increase of domestic consumption.

The last quarter's revenue, exhibits a decrease from the corresponding quarter of the former year of L. 168,834; of which the deficiency in the excise is L. 149,602. By the repeal of the leather duty, which took place on the 10th of July last, it is computed, that a decrease on this branch of the revenue has taken place to the extent of somewhat more than L. 100,000. The repeal of the beer duty has produced a similar result, but has operated in a different manner and degree. The repeal of this duty did not take place till the 10th of October. But the brewers being allowed by law, to store beer, free of duty, for consumption after the 10th of October, it is apparent that all on hand, and on which duty had been already paid, would be first consumed, and that none but those who found it necessary to brew for immediate sale, would brew more beer, and pay a duty upon it. All others would run off their old stock, and store what they were now brewing, to be released on the duties being withdrawn. That this is the state of the matter, is perfectly well known to those in the trade, and may be made further apparent by the state of the brewers' returns in London for the last year, which show a falling off in the quantity of beer, on which duty has been paid, of about 30 per cent. It will not therefore be too large an allowance, to take the diminution of the quantity of beer throughout the kingdom, on which duty would have been paid, at 25 per cent., which is just equal to three months' consumption. It may be inferred that little beer, comparatively speaking, paid duty during the last three months, and a smaller quantity

* From Parliamentary Returns of the tonnage entered inwards, it appears that there has been an increase of British shipping, since the year 1815, of about 69 per cent.; and of foreign shipping engaged in trade with the united kingdom the increase has been about 18 per cent.

than usual during the preceding three months. Estimating the deficiency in the first of these quarters, as equal to one month's consumption, and in the second as equal to two months' consumption, we have the following result with relation to the excise revenue of the last quarter.

Deficiency in excise revenue,	-	L. 149,602	0	0
Increased duties laid on spirits, estimated for the				
quarter at	- - -	120,000	0	0
		<hr/>		
		L. 269,602	0	0
Deficiency of beer-duty on a quantity equal to				
two months' consumption,	L. 490,000	0	0	
Deficiency of leather-duty,	100,000	0	0	
	<hr/>		590,000	0 0
			<hr/>	
Increase on remaining duties of excise,		L. 320,398	0	0

which, making every allowance for the effects of a general election, we hold to be indicative of an increased expenditure on articles of domestic consumption.

If this be the evidence of an increasing demand for commodities subject to excise, we may hold it to be yet more so for the primary necessities of life; and we anxiously trust that the effect will soon be felt on that great branch of national industry to which our remarks have an especial reference. All the fulfilment of such hopes, however, must depend upon the maintenance of Peace. With that one word, how many hopes and fears are associated! Some persons there are amongst us, who cry out that we are well prepared for war. We tell those who imagine so, that war now would be the curse of the people, and is to be avoided as the greatest of public evils. Those who can recollect the sudden stimulus to production and demand which the last war produced, might expect to see war operate now in an entirely opposite manner, and to lessen production as well as demand. The circumstances under which we should be able now to engage in the dreadful hazard of a contest, would be different indeed from those under which nearly forty years ago we were able to do so. The public debts, which then admitted of a vast addition, without impairing the national resources, could not now be added to without the hazard of ruin to public credit. How would all classes feel the re-imposition of those destructive taxes from which we are now escaping? What would be the effect of a fall of 40 or 50 per cent. on the public securities, to the thousands who have their property invested in them? What would be the result to public and private credit? Are we prepared to run the same fatal course

with respect to the currency which we have already run? We tell the advocates for war, if such there be, that in six months the Bank of England would not be solvent without a repetition of the act of 1797. All plans of retrenchment and reform in the public expenditure would be at an end at once; all that has been done and suffered for the last fifteen years to repair the public resources, would have been done and suffered in vain. But let us trust that of all the evils we have to dread, we shall be spared the useless infliction of war. Deep indeed is the responsibility of the Executive Government, on whose prudence and integrity so much depends; and well will it merit the gratitude and support of the country, if it shall preserve us from the dangerous vortex which is in action around us. Let us leave to other nations the task of directing their own affairs;—let their angry passions have full scope, even should it be to avenge, on the heads of unthinking princes, broken faith and violated rights. Our province is to husband our own resources, and to amend our own institutions, where they require amendment. Public industry has been oppressed for a season; but it is not destroyed. Our powers and resources are yet marvellous, and surpass those of any other people; and notwithstanding errors that may be regretted, and sufferings that have been endured, there are blessings enough left us to make every honest man love his country.

TABLES OF PRICES, &c.

The Average Prices of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets:—

LONDON.						
Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1830.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
July 13.	72 2	28 8	37 3	37 2	38 0	37 2
28.	72 3	30 6	38 2	40 4	39 0	37 6
Aug. 2.	74 9	30 4	39 1	42 2	43 0	39 0
9.	78 0	30 9	39 11	42 2	42 6	40 0
16.	78 0	31 6	30 4	44 0	41 8	40 6
23.	74 0	30 1	30 9	44 6	39 6	39 6
30.	72 1	30 5	29 2	38 0	40 6	38 6
Sept. 6.	71 10	29 7	29 8	36 6	42 0	38 4
13.	67 6	30 5	28 2	34 6	42 0	38 6
20.	64 9	31 4	27 4	35 6	41 6	39 6
27.	60 9	33 3	27 5	32 0	40 6	40 0
Oct. 4.	62 4	35 0	27 0	39 6	41 0	40 6
11.	62 4	36 5	27 7	34 6	41 6	40 0

HADDINGTON.						
Date.	Wheat.	Barley.	Oats.	Pease.	Beans.	
July 23.	s. d.	s. d.	s. d.	s. d.	s. d.	
30.	67 104	36 42	33 9	38 2	48 8	
Aug. 6.	65 34	34 28	33 63	48 9	45 71	
13.	64 104	37 11	33 118	43 11	42 42	
20.	64 10	34 1	33 2	41 104	44 0	
27.	61 5	36 64	34 54	44 0	42 2	
Sept. 3.	64 11	38 1	34 111	44 64	45 0	
10.	64 24	31 02	33 64	44 34	45 3	
17.	63 11	30 4	30 2	45 3	48 0	
24.	62 61	32 34	29 0	47 6	48 0	
Oct. 1.	58 64	31 24	26 11	48 0	47 2	
8.	58 9	29 24	23 11	47 4	47 0	
15.	59 61	32 4	26 24	36 84	41 104	

LIVERPOOL.						
Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1830.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
July 13.	68 7	31 11	27 10	37 6	38 0	36 8
20.	68 5	34 2	28 9	40 0	38 6	36 10
27.	69 6	36 4	32 7	42 6	30 10	37 6
Aug. 3.	71 1	38 6	33 8	43 6	41 8	38 10
10.	71 4	38 1	34 2	44 6	42 0	40 2
17.	67 4	38 6	33 6	44 0	40 6	39 6
24.	66 9	36 6	30 10	42 2	41 2	39 0
31.	61 0	34 10	28 10	40 6	41 6	38 6
Sept. 7.	64 10	34 4	26 2	38 4	41 8	38 6
14.	67 7	34 0	26 7	36 6	40 8	39 2
21.	60 0	34 8	27 10	34 2	40 6	40 6
28.	62 9	32 4	27 5	32 8	41 4	40 0
Oct. 5.	61 10	32 1	29 4	34 0	40 6	40 0

EDINBURGH.						
Date.	Wheat.	Barley.	Oats.	Pease.	Beans.	
1830.	s. d.	s. d.	s. d.	s. d.	s. d.	
July 31.	69 2	36 6	32 113	49 104	47 8	
28.	68 104	37 6	33 6	48 6	46 10	
Aug. 4.	65 04	36 6	33 2	47 0	46 6	
11.	66 104	35 24	33 0	45 8	46 2	
18.	66 10	36 0	33 4	44 8	45 4	
25.	63 24	35 6	32 1	44 3	43 6	
Sept. 1.	63 71	33 6	32 9	44 0	43 0	
8.	66 84	32 0	30 64	44 6	43 8	
15.	61 6	31 24	31 3	45 0	44 2	
22.	62 4	33 34	31 14	46 4	45 2	
29.	67 8	33 6	35 0	48 2	46 4	
Oct. 6.	67 24	32 24	36 14	48 6	47 6	
13.	65 34	32 24	35 64	48 2	47 0	

TABLE showing the Weekly Average Prices of all kinds of GRAIN, made up in terms of the 7th and 8th Geo. IV. c. 58, and the Aggregate Averages of the six weeks which regulate the Duties payable on FOREIGN CORN; and the Duties payable thereon.

Date.	Wheat.			Barley.			Oats.			Rye.			Beans.			Pease.			
	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	
1830.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	
July 16.	69.	667	2 18	63 1	131	0 15	427	226	8	7	9 36	9 37	0 14	0 36	10 36	9 15	6 38	2 37	5 14
23.	70	367	1 18	61 31	10 31	2 15	4 28	236	11	7	9 39	11 37	7 14	0 37	4 36	10 15	6 38	6 38	6 12
30.	72	869	1 15	63 131	4 15	4 28	236	11	6	3	4 41	7 38	8 12	6 38	9 37	9 14	6 42	8 38	10 12
Aug. 6.	74	1170	6 10	63 531	8 15	4 29	10 20	6	4	9	4 43	2 39	8 11	6 39	9 37	9 14	6 42	3 39	5 11
13.	74	1171	9 6	63 632	6 13	10 30	320	7	4	9	4 43	10 40	7 9	6 39	10 36	3 12	6 42	8 40	7 9
20.	73	472	7 2	63 632	6 13	10 30	320	7	3	3	4 44	9 41	6 8	6 39	6 30	3 12	6 39	9 40	6 9
27.	71	472	10 2	63 632	6 13	10 30	320	7	3	3	3 35	3 38	11 12	6 38	3 38	11 12	6 40	4 40	10 9
Sept. 3.	70	572	11 2	63 632	6 13	10 30	320	7	3	3	3 36	6 38	4 12	6 38	10 39	2 11	6 41	11 41	5 8
10.	66	571	11 6	63 632	6 13	10 30	320	7	4	9	4 34	2 37	1 14	6 38	7 39	1 11	6 41	10 41	4 8
17.	62	4 69	9 13	63 838	9 13	10 34	2 27	11	6	3	3 35	4 36	5 15	6 38	5 38	11 12	6 40	4 41	9 8
24.	60	3 67	4 18	63 532	9 13	10 25	0 27	1	6	3	3 31	4 34	10 18	3 39	4 39	9 12	6 40	10 40	8 9
Oct. 1.	66	865	3 21	63 139	7 13	10 25	1 06	2	7	9	3 32	7 34	1 18	3 40	4 38	11 12	6 40	11 41	9 8
8.	62	0 63	6 23	6 35	4 32	11 12	10 24	11 25	5	9	3 33	10 33	10 19	9 40	10 39	4 11	6 40	3 41	8 8
16.	62	0 62	4 34	6 35	1 33	4 12	4 34	9 24	11	10	3 34	0 33	6 19	9 40	9 39	8 11	6 41	2 40	10 9

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, showing the Quantities of Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; the Quantities upon which duties have been paid for home-consumption, during the same Month; and the Quantities remaining in Warehouse at the close thereof: from 1st June to 1st September 1830.

1830. Month ending	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN WAREHOUSE.		
	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.
July 1.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, . . .	173,023 6	..	173,023 6	23,898 1	..	23,898 1	443,687 3	2,100 3	445,787 6
Barley, . . .	27,568 7	..	27,568 7	1,975 6	..	1,975 6	105,826 2	..	107,801 8
Oats, . . .	37,567 6	..	37,567 6	26,830 0	..	26,830 0	440,682 3	..	467,512 3
Rye, . . .	817 0	..	817 0	514 4	..	514 4	27,791 4	..	28,305 8
Pease, . . .	3,508 4	..	3,508 4	1,625 3	..	1,625 3	12,122 2	..	13,747 5
Beans, . . .	2,613 1	..	2,613 1	..	..	..	9,080 0	..	9,080 0
Maise, . . .	0 1	..	0 1	912 5	..	912 5	71 3	..	71 3
Buckwheat, . . .	3 7	..	3 7	..	..	..	147 5	..	147 5
Totals, . . .	245,103 0	..	245,103 0	55,765 3	..	55,765 3	1,038,478 6	2,100 3	1,040,578 9
Wheatmeal or Flour, . . .	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
Oatmeal and other sorts, . . .	111,310 0 10	1,410 0 20	112,720 1 2	2,036 2 27	731 1 27	2,768 0 26	281,515 2 23	908 1 0	282,423 3 23
Totals, . . .	111,310 0 10	1,410 0 20	112,720 1 2	2,036 2 27	731 1 27	2,768 0 26	281,515 2 23	908 1 0	282,423 3 23
August 1.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, . . .	160,953 4	10,776 7	171,730 1	10,656 6	12,839 2	23,495 8	588,149 1	38 0	588,187 1
Barley, . . .	14,759 6	..	14,759 6	896 7	..	896 7	119,152 0	..	120,048 7
Oats, . . .	67,361 1	..	67,361 1	55,909 7	..	55,909 7	432,624 5	..	488,533 2
Rye, . . .	25 1	..	25 1	257 0	..	257 0	26,880 5	..	27,137 5
Pease, . . .	2,373 7	8 2	2,382 1	3,568 3	8 2	3,576 5	10,480 3	..	14,056 6
Beans, . . .	959 2	..	959 2	32 0	..	32 0	10,482 7	..	10,514 7
Maise, . . .	194 7	..	194 7	174 7	..	174 7	91 3	..	195 10
Buckwheat, . . .	..	..	..	9 5	..	9 5	138 0	..	138 0
Totals, . . .	246,537 4	10,785 1	257,322 5	71,525 3	12,847 4	84,372 7	1,188,036 0	38 0	1,188,074 0
Wheatmeal or Flour, . . .	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
Oatmeal and other sorts, . . .	118,120 3 23	18,452 2 3	136,573 1 26	991 3 2	18,575 1 2	19,567 0 4	378,114 8 15	96 0 3	378,210 8 18
Totals, . . .	118,120 3 23	18,452 2 3	136,573 1 26	991 3 2	18,575 1 2	19,567 0 4	378,114 8 15	96 0 3	378,210 8 18
September 1.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, . . .	288,000 7	23,516 2	311,517 1	298,468 6	21,651 0	320,119 6	586,687 0	1,683 2	588,370 2
Barley, . . .	20,050 4	..	20,050 4	1,424 0	..	1,424 0	138,674 7	..	140,098 7
Oats, . . .	128,574 2	1,300 0	129,874 2	239,886 7	1,900 0	241,786 7	314,277 1	..	346,063 8
Rye, . . .	12,373 3	..	12,373 3	1,916 1	..	1,916 1	34,798 7	..	36,714 8
Pease, . . .	3,192 5	575 6	3,768 3	2,231 4	865 0	2,496 4	11,485 3	..	13,981 7
Beans, . . .	1,344 1	..	1,344 1	171 1	..	171 1	10,904 3	..	11,075 4
Maise, . . .	..	..	..	30 0	..	30 0	71 3	..	71 3
Buckwheat, . . .	1 0	..	1 0	1 0	..	1 0	138 0	..	138 0
Totals, . . .	453,536 6	25,392 0	478,928 6	544,069 3	23,226 0	567,295 3	1,091,038 0	1,683 2	1,092,721 2
Wheatmeal or Flour, . . .	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
Oatmeal and other sorts, . . .	18,385 0 16	17,765 0 16	36,151 1 4	88,956 0 0	18,716 3 4	107,672 3 4	311,670 2 8	1,683 1 1	313,353 3 9
Totals, . . .	18,415 0 16	17,783 0 16	36,181 1 4	88,956 0 0	18,716 3 4	107,672 3 4	311,672 1 8	1,683 1 1	313,353 3 9

SUMMARY of the Importation of Foreign Corn since 1st January 1830.**IMPORTED.**

During the month of	Wheat.	Barley.	Oats.	Rye.	Pence.	Beans.	Maize.	Buckwheat.	Wheatmeal or Flour, Oatmeal and other sorts.
	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Cwt. qr. lb.
January, .	13,594 0	549 4	113 2	..	460 3	338 3	1 1	.. 0 1	7,378 3 17
February, .	2,613 4	79 2	9 5	..	156 4	41 4	6 5	..	17,506 2 14
March, .	4,131 1	0 1	2 1	..	5 3	..	0 6	..	28,543 0 23
April, .	46,630 2	1,767 4	15 3	1,540 1	382 2	..	409 1	108 7	33,656 3 7
May, .	247,595 5	15,866 1	5,130 0	395 2	2,085 4	4,163 5	1 0	0 1	100,910 2 9
June, .	173,623 6	27,568 7	37,567 6	817 0	3,508 4	2,613 1	0 1	3 7	112,790 1 2
July, .	171,600 3	14,759 6	67,361 1	25 1	2,362 1	959 2	194 7	..	135,573 1 26
August, .	311,517 1	20,050 4	125,674 2	12,373 3	3,768 3	1,344 1	..	1 0	36,181 1 4
Totals, .	971,755 6	80,364 5	240,073 4	15,081 7	12,789 0	9,460 0	613 5	108 0	472,771 0 21

PAID DUTY FOR HOME CONSUMPTION.

During the month of	Wheat.	Barley.	Oats.	Rye.	Pence.	Beans.	Maize.	Buckwheat.	Wheatmeal or Flour, Oatmeal and other sorts.
	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Cwt. qr. lb.
January, .	1,614 5	..	340 5	..	1,012 1	4 0	1 4	6 3	149 3 13
February, .	380 4	7 2	2 3	4 6	180 5	41 4	6 5	16 0	712 1 1
March, .	238 3	7 4	95 4	..	34 7	..	0 6	..	39 2 10
April, .	7,754 5	0 3	22 7	..	488 4	0 3	..	27 5	49 1 19
May, .	226,895 7	326 3	170 3	13 2	734 0	29 4	194 2	34 5	56,733 2 14
June, .	23,808 1	1,975 6	26,830 0	514 4	1,625 3	..	912 5	..	2,768 0 26
July, .	23,496 0	806 7	55,909 7	257 0	3,596 5	32 0	174 7	9 5	19,367 0 4
August, .	380,129 6	1,424 0	241,166 7	1,916 1	2,498 4	171 1	20 0	1 0	107,672 3 4
Totals, .	605,407 7	4,753 1	324,547 3	2,705 5	10,148 5	278 4	1,300 5	98 2	187,102 0 7

PRICES OF BUTCHER MEAT.

	SMITHFIELD, Per Stone of 14 lb.		MORPETH, Per Stone of 14 lb.		EDINBURGH, Per Stone of 14 lb.		GLASGOW, Per Stone of 14 lb.	
Date.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
July	4/9 @ 7/9	5/3 @ 7/10	4/6 @ 5/6	4/ @ 5/6	4/9 @ 5/9	4/6 @ 5/6	5/ @ 5/	5/3 @ 6/3
Aug.	4/6 5/9	5/3 7/8	4/3 5/9	4/3 5/8	4/6 5/6	4/3 5/6	4/10 5/9	5/ 6/
Sept.	4/ 7/6	4/4 6/9	4/6 5/9	4/3 5/9	4/ 5/3	4/ 5/	4/3 5/3	4/6 5/3

PRICES of English and Scotch WOOL.

ENGLISH, per 16 lb.—*Merino*, Washed, 16/6 @ 24/6; in Grease, 12/6 @ 15/6.—*South Down*, 12/6 @ 18/6; *Leicester Hog*, 12/6 @ 16/6; *Ewe and Hog*, 12/ @ 14/6.—*Moor*, *Ewe and Hog*, 6/6 @ 8/6.

SCOTCH, per 16 lb.—*Leicester*, *Hog*, 15/ @ 18/; *Ewe and Hog*, 12/6 @ 16/6.—*Cheriot*, *Hog*, 12/6 @ 13/6.—*Ewe*, 10/6 @ 13/6.—*Moor*, *Ewe and Hog*, 5/6 @ 9/.—*Cheriot laid* per 24 lb 11/6 @ 14/.—*Moor*, 6/6 @ 8/6.

THE REVENUE.

ABSTRACT of the Net Produce of the Revenue of Great Britain, in the Years and Quarters ended on the 10th October 1829 and 1830, showing the Increase and Decrease on each head thereof.

	Years ended October 10.		Increase. Decrease.		Quarters ended October 10.		Increase. Decrease.	
	1829.	1830.			1829.	1830.		
	£	£	£	£	£	£	£	£
Customs, ..	15,961,206	16,485,749	464,536	..	5,028,696	5,069,349	40,653	..
Excise,	17,904,027	16,933,577	..	970,450	5,368,237	5,118,635	..	149,602
Stamps, ...	6,704,692	6,578,181	..	126,511	1,747,696	1,701,378	..	46,318
Post-Office,	1,396,000	1,349,006	..	46,994	358,000	370,006	12,006	..
Taxes,	4,905,186	4,968,450	62,564	..	801,306	831,175	29,869	..
Miscellaneous,	600,848	273,947	..	326,901	179,960	104,500	..	75,460
	47,472,659	46,528,903	527,100	1,470,856	13,083,671	12,895,043	82,568	271,408
	Deduct Increase. .	..	..	527,100	Deduct Increase, . .	..	..	82,568
	Decrease on the year, .	..	..	£ 943,756	Decrease on the quarter.	..	..	£ 168,834

FOREIGN CORN MARKETS.

In consequence of the general anticipation, which has been since realized, that the averages of wheat would so advance, as to reduce the duty to a low point, very extensive orders were transmitted, in the early part of the season, to the various Continental markets; and considerable purchases continued to be made till within the last six weeks, when it became evident that the averages, chiefly from the inferior quality of the new wheats, would again decline, and so occasion a corresponding advance in the rate of duty. The duty having already advanced from 2/8 to 23/8 $\frac{1}{2}$ quarter, the demand abroad, generally, has greatly subsided, but prices have not receded so much as was anticipated, in consequence of the wants of Holland being so great as to require considerable supplies from the Baltic; and by our latest advices there was still a good deal of inquiry for shipment to that country. In consequence of the lateness of the harvest all over the north of Europe, we have not yet received the reports of the result, but we extract the following from the advices we have from time to time received during the last three months.

HAMBURG.—The complaints from all districts are very great. In some, fears are entertained that not enough of corn will be saved for the consumption of the inhabitants. This may be considered an exaggeration, but that the harvest, up to the present time, namely the 30th September, has been an unexampled bad one for all low countries, is certain. The only good corn we can expect, will probably be from the high lands, and even on such lands, much has been carried in a damp condition; and in Holstein, not above half the harvest has yet been secured.

The supplies of new corn, of any sort, are yet inconsiderable. No wheat

has yet appeared, and only one sample of barley, and one of oats, both of which are inferior. No fresh supplies of old wheat have been received. The late supplies have generally been taken to granary. The demand for consumption is steady. Rye continues in good demand, and supplies are expected from England. Barley is very little inquired after, while oats meet a ready sale for consumption.

Quotations,

Wheat, . . . 46/ @ 49/ free on board.	Oats, . . . 18/ @ 18/
Rye, . . . 32/ @ 33/	Pease, . . . None at market.
Barley, . . . 21/ @ 23/	

COPENHAGEN AND THE DANISH ISLANDS.—Our prospects for crops are generally very bad. Only the small farmers have yet got in their corn, which is inferior and damp. The larger farmers have much to do; indeed as yet they have got very little cut. Much damage has been done in all the surrounding provinces, except in a few parts, where less rain has fallen. It is yet too early to say, with any degree of certainty, how prices for new grain may rule, and as to old, there is almost none left.

ROSTOCK.—The harvest being now pretty generally finished in this country, we beg to report our opinion of the result, which is founded on personal observation. A correct estimate, however, cannot be formed till the corn is thrashed. The winter crops, in particular, are quite deficient, having suffered, as well by the last severe winter, as by the incessant rains during harvest-time, and may almost be said to be little short of a total failure. The summer crops were very promising before the heavy rains, and some portion of the oats have been housed in fine condition; yet the greater part, as well as barley, has suffered by the inclement season. The wheat is generally estimated not to yield more than one-third of an average quantity; and of this grain, there is certainly not a fourth part, which is not sprouted, shrivelled, or rusty, and generally of indifferent colour and poor weight.

The best samples yet exhibited do not exceed 59 lb $\frac{1}{2}$ bushel, and we dare not calculate on more than 58 lb as an average.

The rye is still shorter in quantity, generally of very inferior and light quality, and probably not sufficient for the consumption of our own country. Pease are mostly sprouted, and carried in damp condition, but in quantity they may yield an average.

Barley will be discoloured—the weight may be 50 @ 51 lb, and as regards quantity, the crop will prove a fair average produce. The same may be said of oats, and as these are partly got in better, they will be of a good average weight, say 34 @ 35 lb $\frac{1}{2}$ bushel. Of old corn, the granaries are quite cleared, except about 500 lasts of rye, of which the price has advanced considerably, and 32/ free on board $\frac{1}{2}$ quarter, is now demanded.

It is impossible to say how prices may rule for new wheat, as there are no supplies come to town yet, except a few sacks brought by the peasants, which are eagerly taken by our bakers, and at prices equal to 44/ @ 48/ $\frac{1}{2}$ quarter. This year there will be a great difference in the price of good and inferior

corn; probably wheat may rule from 35/ @ 45/ according to quantity: barley 14/ @ 15/, and oats 10/ @ 12/: pease 18/ @ 20/.

Dantzic.—The weather throughout the season has been generally wet, and only occasionally have we experienced a dry day. Some of our farmers have managed to get in their wheat and oats; but as yet only small quantities of the former have been brought to market, which prove of fair quality and weight. As to quantity, there is a full average crop, but there can be no doubt that a good deal is damaged. Of large new pease, none have been yet shown. Some of a small sort have been at market, which brought 18½ @ 20/; they were of good colour, and pretty free from black pickles. It is to be hoped that some part of the crop of the large sort have been got in in good condition; but much injury must have been done to this crop also.

The new oats that have been exhibited are not of good colour, but some have been secured of good quality. Beans and barley are still in the fields.

As to the stock of old wheat, it is very small indeed. It is supposed that there are not above 1000 lasts of all sorts in this place. We have had a little stir for the Dutch markets, and some parcels have been taken off at prices from 40/ @ 52/ as in quality. The few oats that remain are held at 11/ @ 12/. There is little demand for barley, which is held at 13½ @ 15/.

Of our new crops, there will be little in a state fit to stand a voyage, but such as will do so will command a much better price, particularly wheat and pease. We shall find it necessary to resort a good deal to kiln-drying.

THE
QUARTERLY
JOURNAL OF AGRICULTURE.

ON THE NAVIGATION OF THE RHINE.

THE powerful influence which the prosperity of any one great branch of public industry exercises upon all the rest,—the intimate relation subsisting between the landed, and all the other interests of the country,—may sometimes induce us to direct attention to other departments of industry than that which is immediately connected with land. But, although the connexion may seem to be indirect, it may not be the less strong. With the commercial interests of the country, those of the landed interests are firmly united; and when we point out a means of promoting the prosperity of the one, we may not the less show how the good of the other may be served.

The unrestrained intercourse of all nations with each other, is the true principle of prosperity to all. The free access of all nations to the British market, is undoubtedly, to our nation, the basis of its commercial prosperity. If the government of any European nation thinks proper to fetter the commercial intercourse of its subjects with this country, by duties of import and export, and by other restraining laws, we can only regret that a short-sighted policy, or an erroneous system of finance, should induce or oblige that government to adopt measures contrary to its real interests. We cannot throw the first stone, for we ourselves are but beginning to shake off this political sin of governments against their subjects. We must trust to the slow

and sure progress of enlightened principles of trade ; to the slow and sure victory in the market of the general consumption of mankind, which all that is good and cheap must obtain over all that is merely fostered by protective laws and duties. We can only negotiate, and endeavour, by acting ourselves on liberal principles, to induce governments to enter on a system of reciprocal intercourse. But if nations, willing to hold intercourse of mutual advantage with each other, are restrained, not by their own governments, but by the laws and enactments of any third power, we are entitled to examine the rights of that power ; and the governments whose subjects are thus prevented from holding beneficial intercourse, neglect their duty if they are slow to interfere. How has our government acted since the memorable epoch of the settlement of the affairs of Europe on their present footing in 1815 ? This is a great and serious question. The period has been one of unexampled and continued distress to the manufacturing and commercial interests of Great Britain—a period of gloom, cheered only by momentary rays of sunshine. What has our government done to open up the channels of intercourse with the nations of the Continent which are inclined to hold intercourse with us ? The history of the intercourse upon those great *water-streets* of the European people—the Rhine and the Elbe—will, we fear, show that our government cannot hold itself blameless ; that great interests at home—the relief of our manufacturing population, by facilitating the intercourse with the consumers of their productions—have been sacrificed to petty foreign interests—to giving a revenue to third powers, derived from duties on that intercourse, and, in effect, on British industry.

The Rhine is the *highway*, the common road, which connects a great proportion of the civilized world with the people of Great Britain. For many ages, the intercourse of nations up and down this thoroughfare, was a direct and unrestrained intercourse ; and, in the sixteenth century, the commercial cities upon the Rhine held a direct and flourishing intercourse with distant countries. When the provinces of Holland belonged to the Spanish monarchy, no sea-duties were levied upon their coasts on ships coming from sea and bound to ports up the Rhine, or coming from ports up the Rhine and bound over sea.

The Rhine was the fair passage to seaward, which all who dwelt upon the Rhine had the same right to use as those who dwelt at its mouths. It was during the struggle of the Dutch for their independence, that single provinces, and even single towns, in Holland, began to raise a revenue by imposing license-duties on shipping bound to ports belonging to their enemies in the Spanish Netherlands. At a diet of the deputies of the Free Towns, held in Augsburg in 1566, the cities of Cologne and Strasburg complained of these arbitrary novelties; and, at the general diet held at Spire in 1570, many other free towns, and the circles of Bavaria, Suabia, and Franconia, remonstrated against the duties imposed by the Dutch on the free navigation of the Rhine. In 1575, it was represented to the Emperor of Germany and the Electoral Princes, that all trade to the Hans Towns from the cities on the Rhine, and from the Hans Towns to the Rhine countries, was entirely stopped by the exactions of the Dutch. In 1580, the States-general of the United Provinces, encouraged by the weakness of the Germanic body, and by the ease with which single provinces and towns raised a revenue from their neighbours, passed a law, without negotiation or communication with the German States connected with the Rhine, declaring that no goods should pass out or in, by sea or by land, through the United Provinces, without first paying duty. The commercial interest in Germany could not sit quiet under such a law. The cities on the Rhine complained to the German Diet of their navigation being annihilated by the Dutch. The city of Lubeck, in 1582, sent a memorial to the Emperor, craving immediate relief; and there was but one opinion and feeling in Europe as to this unjust and oppressive measure. But the Thirty Years' war in the first half of the following century, the religious disputes which occupied the minds of men, the divisions and wars, which scarcely allowed governments to recruit from the effects of war and turn to the affairs of peace, prevented any effectual interference in behalf of the free navigation of the Rhine. The weakness and inertness inherent in the Germanic constitution, could give no weight to remonstrance. At the peace of Westphalia, the German envoys urged strongly the injustice of shutting the mouths of the Rhine, but with no

practical result. The right to shut the sea-approach to the Rhine remained on this footing,—not admitted by those states which were thus excluded from the sea, but exercised practically and rigorously by the Dutch. It was their *Navigation Law*; and it was, like all other restrictions and hinderances on free trade, exercised to their own loss. Hamburg and Bremen obtained a great share of the trade of supplying the interior of Europe. Nations found other channels of trade, in which Holland could not compete with any peculiar advantage; while, by keeping shut up for her own use, the natural channel through which much of the trade of the interior of Europe would naturally have gone, she only forced a trade with part of the Rhine-countries; and, by preventing other vessels from navigating from the Rhine to the sea, Dutch vessels were prevented from navigating on the greatest part of the Rhine. The decay of the United Provinces previous to the beginning of the French Revolution, may be ascribed in a great measure to this illiberal policy. By attempting to monopolize all trade with the interior of Europe, they lost even the supplying of the consumption of the country immediately behind them. The Rhine remained in their hands, merely an inland sea,—its trade confined to the passing of goods from port to port on its own banks. All goods imported across the high seas to the people of Europe, reached them by other channels than through Holland; and the shipping of Holland was, by retaliatory duties, debarred from navigating on the greater part of the Rhine, as the navigation of the mouths of the Rhine to and from sea was shut by Holland to the shipping of other nations. This is an instructive lesson on the prohibitive system applied to commerce.

By the peace of Luneville, France got possession of the left bank of the Rhine. The German states appear to have understood the principles of trade better than their Dutch neighbours; and, in 1804, entered into a convention with France upon the navigation of the Rhine. From Switzerland to the frontier of Holland, the Rhine was declared to be a common water-road to all countries having access to its stream; a common rate of duty was agreed upon, suitable to the complicated circumstances which the support of embankments and towing-paths render

necessary in different divisions of the Rhine. Two-and-thirty duties were abolished, and a system was established, which could not perhaps be improved, for the interior navigation of the Rhine, from where it is first navigable to where it enters Holland—to where, speaking truly, it was for every purpose of commerce *lost in Holland*. Europe was advancing too rapidly, even amidst the wars and revolutions of this period, to allow the common right to an access to the sea through the Rhine to be closed by a monopoly. Holland became a part, an acknowledged and recognised part, of the empire of France. The Emperor Napoleon, who has framed laws which will influence society when his victories, his power, and his defeat, will appear like a fairy tale interwoven in the history of the age, issued a decree, on the 21st October 1811, declaring that all duties, taxes, and impositions of every kind, levied upon ships and goods passing through Holland to or from sea, by the four mouths of the Rhine,—the Waal, the Lower Rhine, the Leck, and the Yssel,—should cease; and establishing, in place of those prohibitory duties, a system of duties upon the same principle as those established in 1804 on the Upper Rhine. By this remarkable decree, the free use of the mouths of the Rhine to and from sea, was, after an interval of two hundred and thirty years, again restored to the people of the interior of Europe. From the circumstances of the times, this restoration had little practical effect on commerce; but it was not unimportant. It was a legal document of a right granted by an acknowledged government of Holland (for all the European powers of the Continent had acknowledged the Imperial government), and which could not be taken away by a simple act of any future government of Holland, without the consent of others interested in that right. It replaced the other nations of Europe in possession of an ancient right from which they could not fairly be again ejected, without the consent of their own governments.

The navigation of the Rhine stood on this footing, when, in 1813, the allied powers advanced against the Netherlands. In November 1813, the French troops were forced to withdraw; and, on the 30th November 1813, the hereditary Stadtholder landed at Schavenning with 4000 English troops, and hastened to Amsterdam. He was there proclaimed the sovereign of

a free country, and Holland once more took her seat among nations as an independent state. To what country Belgium should be annexed, or whether four millions of people in Belgium might not form an independent state, as well as two millions of people in Holland, were questions for the allied powers to decide. They did decide these questions upon the principles which some politicians conceive the people of Great Britain are called upon to maintain—upon the principle of consanguinity. The Stadtholder of Holland was related to the reigning family of Prussia, and therefore must be made a king. Being made a king, he must get a kingdom. On this monstrous principle, four millions of people were joined to two millions of people, in spite of the difference of language, religion, laws, manners, and interests; and we have seen the result: and we are called upon, in defiance of common sense, to enforce this union as a masterpiece of policy, on which the future fate of Holland depends! The junction—it does not deserve the name of union—of Belgium with Holland, took place on the 16th March 1815; and the Stadtholder, Frederick William, was, by the unanimous voice of the allied powers, declared King of the Netherlands. Fifteen years of peace have elapsed, and this kingdom, so necessary to the balance of power, so essential to the system of Europe, and to the tranquillity of the Continent, falls of itself into pieces. A play-house riot overthrows the wisdom of a congress, and the sensible people of Great Britain are called upon by some sensible men to build up again the house of cards which this congress had erected; and to do so like children, without examining whether, in the next fifteen years or months, it would not be blown down again, from the total want of adhesion in the parts, or of principle in the construction. King Frederick William was in some sort called to the throne of Holland by the voice of the people at Amsterdam in 1813; but he was constituted King of the Belgians by the allied powers. This distinction appears to have influenced both the king and his subjects. He governed Belgium as king of the Dutch, and was considered by the Belgians as the king chosen by the allied powers. The most daring act that ever a monarch attempted, was that of imposing the Dutch language in the courts of law on his Belgian subjects. What would we say, if an English monarch were by

proclamation to abolish the English language in the courts of Westminster, and to order all pleadings, deeds, examinations, and judgments, all records and writings, and all, in short, that is involved in our ideas of law and property, to be carried on in Hindostanee? This would not be nearly so absurd a supposition, as the reality of the measure attempted in Belgium. Our fellow subjects in Hindostan are more than equal in numbers to those British subjects who use the English language; but in this fifteen-year-old-kingdom, one-third part of the population only could speak the favoured language; and of that one-third, nineteen-twentieths did not dwell in the country in which their language was to be alone used in the courts of law.

The same enlightened Dutch policy may be traced in the management of the new government with regard to the navigation of the Rhine. The allied powers had not lost sight of this important object. The importance which they attached to it as an object interesting to the whole of Europe, cannot be more strongly shown than by quoting the words of the 5th article of the Treaty of Paris, of 30th March 1814:

“ La navigation sur le Rhin du point où il devient navigable jusqu'à la mer et reciproquement, sera libre de telle sorte qu'elle ne puisse être interdite à personne, et l'on s'occupera au futur congrès des principes, d'après lesquelles on pourra régler les droits à lever par les états souverains de la manière la plus égale et la plus favorable au commerce de toutes les nations.”

Further, in the second paragraph of this article, it is resolved, no doubt from the experience that nations are kept in a manner strangers to each other, from the misrule of the navigable rivers, that “ Il sera examiné et décidé de même dans le futur congrès, de quelle manière, pour faciliter les communications entre les peuples, et les rendre moins étrangers les uns aux autres, la disposition au dessus pourra être également étendue à tous les autres fleuves qui dans leur cours navigable separent ou traversent differens états.”

This was further ratified by the third article of the secret treaty of Paris, and accepted by the House of Orange in the act of 21st July 1814. It remained with the Congress of Vienna to unfold and render effective the principles here laid down. Six weeks after the opening of the Congress (14th De-

cember 1814), the eight Powers who formed a special committee, to which Holland did not belong, for the affairs of Europe, held a conference for carrying into effect the fifth article of the treaty of Paris. The first meeting was on the 2d February 1815, and the envoys of the states upon the Rhine (Holland, Bavaria, Bodau, Hesse Darmstadt, and Nassau), were invited to attend the conference. The representative of Holland alone possessed the necessary information for entering upon the consideration of this important subject. He alone, perhaps, was fully aware of its importance. At the second meeting of this committee, the English minister indeed required, that, according to the spirit and true intent of the treaty of Paris, the trade and navigation of the Rhine should be declared free to all nations. This proposition, however, was overruled in the committee, on the ground that other states had not declared the same freedom of navigation on their rivers. Our government was here to blame. The Rhine is not a river belonging to any one state, or to any group of states, running through the territory of one or two powers only, and communicating with the subjects only of one or two powers, so that these one or two powers can, on legitimate grounds, claim a right to limit the use of it. The Rhine is a communication-channel belonging to the world. It is like the channel between England and France. These two powers might, upon the same principle, pretend that no nation should enjoy a free navigation through this channel, unless their ships enjoyed an equally free navigation upon the territorial rivers of that nation. Our government was to blame in not having insisted upon a fixed and defined conclusion of the Congress upon the fifth article of the treaty of Paris. Was it an object of no great importance? Our statesmen might have looked around them at Whitehall, and have remembered that the building they were sitting in had originally been erected for the accommodation of the *free trade* of the Rhine. It ought to have awakened the jealousy of our minister at the Congress, that the ministers of the Netherlands at the eighth meeting of the committee, gave in a note, asserting that the Leck alone was the real prolongation of the Rhine. The Rhine, it is well known, divides itself in Holland into three principal branches, the Waal, the Leck, and the Yssel. The Waal takes

two-thirds of the water of the Rhine; of the remaining one-third, the Yssel takes one-fourth, and the Leck three-fourth parts of the one-third of the water of the Rhine. This is not a matter of opinion, but a matter of treaty. In 1775, the proportions were so determined, between the deputies of the United Provinces of Holland and Prussia, and concluded upon after careful examination, as a satisfactory basis for proportioning various rights of water and duties then in question between the two powers. In spite of this determination, and of their own interlocutor at their sixth conference, in which they had declared the two branches, the Waal and the Leck, to be the two branches which were to be considered the *débouchés* of the Rhine, the committee of the Congress was ready to declare, upon the representation of the minister of the Netherlands, that the Leck alone (a branch, which, from want of water, is scarcely navigable) was the prolongation of the Rhine, concerning the navigation of which they had to deliberate. Before the conclusion of their deliberations, the deception was discovered. The error was not expressly acknowledged, but it was rectified, simply by adopting no part of the proceedings upon it in the record. The equally important error was admitted, of recognising the principle, that ships and goods *in transitu* from one nation to another nation, are liable to pay duties to a third nation from which they are neither requiring nor receiving benefit or protection, but are simply passing along its coasts. If such a principle be just, it can make no difference whether it be a river-coast or a sea-coast on which such duties are demanded. To the extent of benefits received, duties are certainly due. The principle, so far, is correct. For lighthouses, buoys, deepening and embanking channels, maintaining harbours and towing-paths, duties are due by all who enjoy the benefit, and justly due; but duties merely for the purpose of increasing the revenue of a state, cannot be justly levied from the subjects of another state passing to another country through a common channel of communication. The committee of the Congress of Vienna went in direct contradiction of the principle adopted by the Congress, and of the fifth article of the treaty of Paris, which was the basis of their deliberations, in resolving that each Power on the Rhine should levy the duties on its own account

as a branch of its rights of sovereignty, subject only to the tariff of those duties, and the mode of levying them settled in 1804; or to be settled by an annual meeting of commissioners from each of the Rhine States, to be held at Mayence, for regulating this common property. It was giving to a group of states, rights which belonged to no one state of the group in any part—the rights of levying duties on the subjects of third parties passing by their doors.

According to the appointment of the Congress of Vienna, this central commission of the States on the Rhine should have met at Mayence on the 1st June 1815, but, owing to the state of public affairs, it was first assembled in August 1816. The first business of this commission was to form an interim scheme of duties, to be levied until a definitive plan could be framed for the duties on the whole course of the Rhine. The duties on the Rhine, through Holland to the sea, were not defined or ascertained, as the duties from the frontiers of Holland up to Strasburg had been, by the agreement of 1804; but no doubt could exist that this part of the Rhine came within the scope of the fifth article of the treaty of Paris, and of the powers granted by the Congress of Vienna to these commissioners, to regulate the navigation of the Rhine, from where it becomes navigable “jusqu’à la mer.” Here arose the first question among the commissioners. Having got out of the committee of Congress into a central commission, Holland insisted on taking part and having a voice with the other commissioners in deliberating upon and fixing an interim scheme of duties for the Upper and Middle Rhine from Basle to the Netherlands; but for the Lower Rhine, that is through the Netherlands, and to the sea, insisted that the government of the Netherlands alone had the right to fix the interim scale of duties. The principle of leaving the duties on this part of the Rhine *in statu quo*, until the definitive scheme authorized by the Congress for the whole Rhine, from its navigable point to the sea, could be arranged, was likewise rejected; and the Dutch Government imposed a duty upon the Lower Rhine of 15 per cent. additional upon shipping, in aid of its own war budget, without reference to the act of the Congress, or to the commission appointed by the Congress. This was even followed, immediately after the central

commission had met at Mayence, by a Dutch act for levying a transit-duty (3d October 1816) of 2 per cent., and in some cases of 3 per cent., upon the value of all goods passing through the kingdom of the Netherlands, consequently of all goods going up or down the Rhine. By this arbitrary, and, if the Congress of Vienna had any legal powers, illegal act, not only were all British, Prussian, or other goods, going up or down the Rhine, subject to a duty of 2 or 3 per cent. on their value to the Dutch government, but practically were subject to the expense of being landed for examination, and for ascertaining that value, and of reshipment at the Dutch port, with all the additional charges of the Dutch agents on these operations, and which, at least, amount to 3 per cent. more. Can it be wondered at if our commercial and manufacturing interests suffered, while our Government supinely allowed the profit which would have kept our merchants and manufacturers in a flourishing state, to be drawn from them in the shape of a duty upon their goods passing to their distant customers through a thoroughfare declared to be common to all nations? If the consumption of British manufactures did not keep pace with the production, can this be wondered at, when the means of the consumer, in a great part of Europe, were taxed to pay the war-debt of the Netherlands? Our ministers of that period have much to answer for. The Prussian Government acted with more vigour. Prince Hardenberg, the chancellor, repaired himself to the Rhine provinces. If the government of the Netherlands would not admit of the interim regulations being fixed by the Mayence commission for the Lower Rhine, neither would the Prussian Government admit of any interim regulations on the Middle Rhine. If the Dutch Government refused the free access to the sea to vessels from the Middle Rhine, the Prussian Government maintained the ancient staple at Cologne, by which all goods must be landed and reshipped at that river port. Prince Hardenberg saw that the Dutch Government, instead of acting with good faith, according to the spirit and letter of the act of the Congress of Vienna, was attempting to establish, as an interim regulation, a system, by which it would keep the sole possession of the navigation of the Lower Rhine, and of the access to and from the sea, and convert it into a source of revenue derived entirely from

the subjects of other states, and would partake also of the navigation of the Middle and Upper Rhine, trusting by delay, and objections to every definitive scheme that might be proposed, to make such an interim regulation, in effect, perpetual. He notified, through the Prussian commissioners, on the 27th February 1818, that his court would not accede to the interim regulation, but insisted on the commissioners proceeding, without delay, to frame the definitive plan.

It was now unavoidable that the chicanery about an interim exercise of disputed rights should cease, and that the principle of these rights should be discussed upon the basis laid down to the commissioners by the Congress of Vienna. The first article of this basis was, "that under the name of the Rhine was comprehended all navigable water from Basle through Amsterdam, Rotterdam, or Dortrecht, into the open sea; and, reversely, out of the open sea, through Amsterdam, Rotterdam, or Dortrecht, to Basle; and that in this sense only the appellation Rhine was to be understood."

The government of the Netherlands, in acceding to this first article, insisted on establishing the following principle, viz. that the portion of the open sea which washes the sea coast of the Netherlands, is, to the extent of a cannon-shot from the shore, part of the territory of the Netherlands. The consequence of this curious principle of a *territorial sea* would be, that the navigation of the Rhine, up or down to this portion of the open sea, was alone subject to the general regulation for the navigation of the Rhine, into and out of the sea, which the Congress of Vienna had referred to the commission; but that the navigation into or out of the main sea, into this territorial sea, belonged entirely to the Dutch, and its regulation was not intended by the Congress to be submitted to the commission. To this extraordinary theory of a sea territory, the German commissioners justly replied, that if there was a sea territory, there must, *a fortiori*, be a stream territory; and that portion of the Rhine-stream, which washes the banks of their states for 165 leagues, is their territorial property upon the same principle; that this, whether territorial or not, was, by a general assent, the government of the Netherlands being a party assenting, to be subject to a general regulation: that, under this theory, the government

of the Netherlands would merely have to remove her custom-house officers lower down, and levy those duties which the commission might do away with on the Rhine, in this newly discovered sea-territory : that no such territorial sea-right was claimed by any state, not even by Hanover on the Elbe, to the extent of preventing the import or export of goods through the mouth of the Elbe to the states situated above Hanover ; or of subjecting such goods in their transit to arbitrary duties ; that Austria declared at Dresden, and the commission had agreed, that any regulation, or arrangement of duties on that river, from Melnick to Hamburg, would be illusory, if, below Hamburg, there was a power to levy *ad libitum* duties, which in effect would do away with any benefit to the intercourse of nations, from the sacrifices made by the powers above Hamburg : that the grammatical construction of the words of the Treaty of Paris (for the commissioner of the Netherlands had been driven to support the view of his court by this argument), was against the meaning attempted to be given to them,—navigation *jusqu' à la mer*, being the usual and correct expression for a navigation into the sea : and that the expression does not mean *to the sea* merely, and not *into the sea* ; and the expression, *jusque dans la mer*, would have been incorrect. The government of the Netherlands, being driven from their theory by argument, attempted to maintain it by concession. They offered to take off the 15 per cent. additional duty they had imposed, without consent of the other states ; to admit the Waal, and not the Leck only, to be the prolongation of the Rhine ; to adhere to the tariff of transit duties, which they had established in 1822, and abolish those they had imposed since that date ; to levy the duties on some articles by their weight, instead of by their value : to limit the total prohibition of salt, tea, herrings, and other articles, to the transit of which this government had opposed a *total prohibition*. The German powers, especially Prussia, remained firm ; and it was evident that the commission was at a close, without any approach to its real object.

The government of the Netherlands received the support of the French government in all its pretensions in this commission. It was the policy evidently of France, to impede as much as possible the direct commercial intercourse of the countries on

the Rhine, through the North Sea, with any other countries. It was evidently no part of the policy of France to support measures, which could only tend to enrich those powers on the Rhine, and particularly Prussia, which were evidently and avowedly established, in order to counterbalance the power of France. As long as the free navigation of the Rhine was impeded by heavy duties, the French manufacturer could find a market for his productions among the people of the south of Germany: every restriction imposed in the Netherlands operated as a bounty to him in supplying the European consumers connected with the Rhine. The French merchant was still more favoured by the pretensions of the government of the Netherlands. The south of Germany was supplied, to a large extent, by land-carriage from Havre de Grace, with goods which would never have passed through the canals, and over the chaussées of France, if the navigation of the Rhine had been free from the fetters imposed on it by the government of the Netherlands. It was the policy of France to favour in every way the pretensions of the government of the Netherlands; her interest, as one of the powers on the Rhine, being incomparably less than her interest in keeping the supply of the great mass of the European consumers connected with the Rhine, in the hands of the French manufacturer and merchant.

During the continuance of this long and fruitless negotiation of the commission at Mayence, it was hoped that, in some of the congresses which were then held, especially in that held in 1820 at Vienna, some steps would be taken to carry into effect the act of the Congress of 1814. Nothing, however, was done until 1822, at the Congress of Verona. The Duke of Wellington, our minister at that congress, upon the appearance of a new tariff of duties by the government of the Netherlands, in which the transit from the sea into the Rhine of some goods was totally prohibited, and the transit of other goods was loaded with heavy duties, gave in a powerful note to the ministers of the allied powers assembled at Verona. His Grace stated, that the first article concerning the navigation of the Rhine, and every principle sanctioned by the act of the Congress of Vienna, declared that "the navigation of that river ought to be entirely free from the point at which it becomes navigable to its mouth."

that, notwithstanding this treaty, to which all the powers of Europe had acceded, "the government of the Netherlands have thought proper to close the mouth of the Rhine against the *commerce of the world*." His Grace added a list of articles, of which the transit through the Netherlands had been prohibited by a law, in spite of the spirit and letter of the treaty; and he called upon the ministers of the allied powers to take the proper steps, through the ministers of their respective courts at Brussels, for the execution of the Treaty of Vienna, relative to the navigation of the Rhine. In the conference of the 27th November 1822, the Congress accordingly came to a resolution on this note, by which, after stating that the difficulties to the free navigation of the Rhine arose principally on the part of the government of the Netherlands, it was agreed, that the several ministers at the Court of Brussels should be instructed to make the necessary representations for bringing the matter to a satisfactory conclusion.

In pursuance of this resolution of the Congress of Verona, the ministers of the four allied powers, Russia, Austria, Prussia, and England, made a strong representation in February 1823, to the government of the Netherlands. It was attempted on the part of this government, to shun the discussion, by reference to the negotiations at Mayence. In the same month, however, the ministers separately renewed their applications. Notwithstanding many repeated and urgent remonstrances, it was July 1825 before an answer was obtained from the government of the Netherlands; and this answer was, that the power of shutting the Rhine, at the mouth of the stream, was a *sovereign right of the kingdom of the Netherlands*. This assumption was at least a reply to the representations of the ministers of the Allied Powers. It was in the most decided manner opposed by England and Prussia; and, from London to Berlin, from Petersburg to Vienna, there was but one opinion upon the right of a free navigation of the Rhine. The interchange of notes between the ministers of the four Allied Powers and the Department of Foreign Affairs of the Netherlands became very lively; and the note of Austria, of 14th February 1826, is particularly remarkable. The freedom of the navigation of the Rhine, into the very sea, says this note, is one of the express conditions

of the existence of the kingdom of the Netherlands. The Allied Powers settled, with regard to that part of the Rhine which flows through Holland, upon the same day on which they settled that the House of Orange should obtain the sovereignty of Holland, and before they joined to it the sovereignty of the Netherlands. They cannot extinguish the principle of the free navigation of the Rhine, which they had proclaimed before the face of the world, in the original record of the restoration of Europe; and this principle is specially sanctioned by the third article of the secret Treaty of Paris; and by the act of 21st July 1814, it is formally acknowledged and acceded to by the House of Orange. The rights of mankind,—so proceeds the note,—stand upon higher ground than ministerial arrangements; and are too intimately connected with the sacredness of treaties, to admit of the four powers relaxing in their demand to be put in possession of a right, acquired for the benefit of all nations, out of any consideration for local circumstances, or for the commercial legislation of the Netherlands. The rights of the European people require, that his Majesty the King of the Netherlands should submit his sovereignty to the conditions settled upon in treaties. For 150 years, by virtue of a treaty which only expired on the 15th May 1795, when the Republic of Holland itself expired, the River Scheldt was kept shut; and now, by virtue of treaties entered into with the allied powers, and the people of Europe, before Holland was admitted into the rank of an European state, the rivers Rhine and Scheldt were declared open.

Russia had already delivered similar sentiments to the court of Brussels, and the uniting with Austria in this remarkable note was only deferred at the pressing instance of the government of the Netherlands, until the reply to it should be given in. This reply of the 13th of June 1826 astonished the Allied Powers. It denied that the Treaty of Paris had conferred the right of sovereignty on the House of Orange. It asserted that Holland had conferred this sovereignty in 1813, at an epoch, consequently, when there was no idea of a Treaty of Paris, or a Vienna Congress: that the king owes his sovereignty, under Providence, to the blood of his forefathers shed for the country; to the renown and prosperity the country had acquired under

them ; to the connexion formed during former ages with his family, and to the free choice of a free people ; that his sovereignty dates, not from the act of 21st July 1814, which only refers to Belgium being joined to Holland in one kingdom, but from the 30th November 1813, when the king landed in Holland, the 2d December 1813 when His Majesty was proclaimed king at Amsterdam, and the 29th March 1814, when the fundamental law was proclaimed ; that the Sovereign Prince assumed the title of King, by his own power and authority, on the 16th March 1815 ; that His Majesty the King would never have accepted the sovereignty from any foreign alliance ; that a foreign proclamation (that of the freedom of the navigation of the Rhine) can have no force in an independent state,—is not binding on it,—and regulations with regard to the navigation of the Rhine can only affect the Netherlands, in as far as the government chooses to become a party to them ; that, with regard to the enlargement of dominion by the junction of Belgium, it arose, not from any advantages Holland might derive from it, but from the necessity of a guarantee for the balance of power in Europe. This extraordinary document, and also the not less remarkable note of Austria, were made known to the public through the Frankfort Journal. Of the Austrian note we may be allowed to say, that, if the Holy Alliance always produces such fruits,—if it is always to be found urging the cause of the people of every country on the principles of common right, with sentiments and language the most just, liberal, and dignified,—the nations of Europe may safely confide the general interests to such enlightened administration. Of the note of the Netherlands we shall only say that it is at least singular and bold, as it stands upon an assumption of rights, which we conceived to be as obsolete as the temporal rights of the Pope in the present day. The answer of Austria was probably of too tender a nature to be communicated to the public. We may conjecture that it would recal to the recollection of the Dutch monarch that Holland was a province of the French Empire, when the Allied Powers, in whose armies there were no Dutch troops, conquered, in point of fact, that empire ; that the former Stadtholder of that province landed at Schevening with a body of the troops of the Allied Powers on the 30th November 1813 ; but

the independence of this French province,—its existence as a state,—was only acknowledged on the 21st July 1814, by the Allied Powers admitting its accession, on that date, to the act of confederation signed at Paris; and the basis of which acknowledgment was the Treaty of Paris of 30th March preceding, in which the free navigation of the Rhine is determined. That the principle of the free navigation of the Rhine was determined, before it was determined whether the province of Holland should, like other provinces of the French Empire on the Rhine, be incorporated with Prussia, or formed into an independent state; that Holland had become a province of the French Empire, and was incorporated with it, by its own solemn act, and had not conquered its own independence—had not co-operated by its own exertions with the Allied Powers, in the overthrow of that empire; that the principle of free navigation to the sea was acceded to as a public right of nations, by states, which did not date their independent existence from the overthrow of the French Empire by the Allied Powers, but which had always constituted the independent administrations of Europe; that, besides Austria and Prussia, Saxony, Hanover, Denmark, Hesse, Brunswick, Mecklenburg, the duchies of Anhalt and Lippe, the cities of Hamburg and Bremen, had sacrificed their private interests to this public principle; and that it could not be expected the government of the Netherlands alone would be allowed to act upon a system adverse to the general interests of Europe.

The government of the Netherlands, in consequence of these notes and remonstrances, issued a new decree of 10th September 1826. This decree declares the Leck alone to be the continuation of the Rhine, through the dominions of the kingdom of the Netherlands; and with reference to this branch of the Rhine, removes the prohibition of goods, of which the transit in any way had been prohibited by the tariff of 1822, and makes various regulations for the ease of Custom-house formalities, upon the goods in transit on this branch of the Rhine. It is unnecessary to discuss these regulations, because that small branch of the Rhine called the Leck, is not navigable for loaded vessels, from want of water, and very often not even navigable for vessels in ballast; and it does not lead to the sea, but

joins the main body of the Rhine water, called the *Maese*, at Crimpen ; and the *Maese* communicates with the sea by two passages, the *Brielle* and *Helvoetsluys* ; but the duties upon these two passages to the sea, on goods or vessels coming from or going to the ports on the Rhine, are not mentioned. This decree, therefore, as far as regards the actual and practical fulfilment of the principle of a free navigation of the Rhine into the sea, is only a deception.

This blockade of the Rhine has turned out, as might have been foreseen, more injurious than beneficial to the Netherlands. Austria is no longer supplied with colonial produce by way of the Rhine. Switzerland receives every thing by way of France or Hamburg, even to the diewoods and cotton used in her manufactories ; because the supplies purchased in Holland would, from the reshipments and delay, be fully three months on the road. The *Elbe*, although the countries which it waters are neither so extensive nor so populous as those connected with the Rhine, transports one-third more of goods into the interior of Europe than the Rhine. The government of the Netherlands, notwithstanding a supplementary decree of 1st March 1827, in which the principle of a *territorial sea* between the Rhine and the main sea is openly asserted, is becoming enlightened. It is to be regretted that it is becoming enlightened, not merely at its own expense, by the loss of revenue and decay of trade, but at the expense of the British manufacturer and merchant, who for fifteen years have been deprived of direct intercourse with the great mass of the consumers of their productions in the interior of Europe—have been paying upon their goods in transit to their customers, duties which would have been a fair profit upon the value—and have been subject to this imposition, of itself sufficient to account for much of the commercial and manufacturing distress of the country during these fifteen years, in direct opposition to the law of nations, as laid down in the Congress of European Nations at Vienna, and levied by a monarch who owes his existence as a royal power to this country, and whose dismembered monarchy we are called upon now to reunite. This enlightened monarch is beginning to be taught by experience, and since 1827 some concessions have been made, which must ultimately lead to a free navigation of the

Rhine according to the true meaning and intent of the Treaty of Paris, and of the Act of the Congress of Vienna. On the 10th September last, for the first time for 250 years, the British flag was seen waving in the river-port of Cologne. We understand it will be the last, probably, as well as the first appearance of the British flag in these waters, if the whole system of delay, expense, and restraint upon the free navigation of the Rhine through the kingdom of the Netherlands, is not revised. It is now the time to do so. The right of any third power to levy a revenue, *ad libitum*, upon the goods and ships of the subjects of other powers, using a common right of passage through the rivers or seas which wash the territory of this third power, cannot be conceded, unless we go back to principles on which the Dey of Algiers might have justified the capture of all who had not purchased a right from him to navigate the Mediterranean. There are men on whom even experience is thrown away; but the Dutch cabinet have surely not remained insensible to the awful lesson which they are now experiencing; that the public opinion and feeling cannot be disregarded by monarchs, when that which excites the public opinion and feeling is in itself right and reasonable. The navigation of the Rhine cannot remain as it has stood during fifteen years, in a state which to Great Britain is in fact a continental blockade; which places between the British manufacturer and the continental consumer of his productions, as great difficulty of direct intercourse, as existed during Bonaparte's continental system of exclusion. It is unnecessary, at this time of day, to enlarge upon the obvious truths, that if the consumer of British goods has to pay *ad valorem* duties upon them, not to his own government only, but to the Dutch government, the less quantity can he afford to purchase, and the less price can he afford to pay. It is the British manufacturer who is the real sufferer. What injures the means of his customers injures him much more even than it injures them. Two or three per cent. of direct transit duty upon the value of a bale of muslin goods, and as much more of charges and expenses of landing and reshipping it in Holland, is of less injury to the consumer, who has only a portion of his capital invested in this way, than to the British manufacturer or merchant, to whom this five or six per cent. upon his whole capital, which is

now going into the pockets of the Dutch king and his subjects for no value received, makes all the difference of a profit, or a ruinous loss, upon his year's transactions.

The Duke of Wellington, in his energetic note to the Congress at Verona in 1822, declares, that "the government of the Netherlands has thought proper to close the mouths of the Rhine against the commerce of the world." It is now due to the suffering commerce of this country, that it be declared whether the mouths of the Rhine were opened to the commerce of the world?—whether they are now open to the commerce of the world?—or whether this power, to whom the Allied Monarchs delivered the keys of the main gate of Europe, does not stand, like the unfaithful steward, giving entrance and passage only to those who pay high fees and duties, and levying unjustly an income from the trade and industry of British subjects? Fifteen years have elapsed since the Allied Powers declared that the Rhine should be open to the commerce of all the world. Our manufacturers, during these fifteen years, have been struggling with difficulties unknown even at the period when, by Bonaparte's decrees of Milan, they were openly and avowedly excluded from the Continent. The cause is obvious. An exclusion from the Continent existed, as complete as that under Bonaparte. The payment of duties to the King of the Netherlands, which were equal to a profit upon the goods that would have satisfied our manufacturers, was as effective a bar to the circulation of British manufactures on the Continent as the restrictive decrees. It was the continental system of Bonaparte in its peace establishment. If our customers, the consumers of our productions in the interior of Europe, could only supply themselves by paying a heavy duty on the value of those productions to the King of the Netherlands, or by transporting their supplies by a circuitous and expensive land carriage, to escape those duties, can it be matter of wonder that the nations of the Continent have been forced to manufacture for themselves? Can it be matter of wonder that our manufacturers are in a depressed state, when they have to pay to the King of the Netherlands what would have been a fair profit to them upon their productions? It amounts to the same thing whether they pay it direct, or whether it is levied from the foreign consumer.

It is equally an addition to the price of their goods, before they reach their final market, which limits the consumption and demand for those goods. Can it be matter of wonder that the return of peace did not bring with it that prosperity and activity in our commercial and manufacturing affairs, which had been anticipated when our intercourse with the main body of our customers was intercepted and taxed?—when the Duke of Wellington officially declares, eight years after the conclusion of the peace, “that the government of the Netherlands has thought proper to close the mouths of the Rhine against the commerce of the world?” What else did Bonaparte do but close the mouths of the Rhine against British commerce? When our manufacturers were daily becoming bankrupts, and the operative population in our manufacturing districts was reduced to the extremity of distress from want of employment, did our ministers do their duty to this country by insisting upon the main channels of intercourse between consumers and producers in Europe being thrown open to the commerce of the world? Or did they supinely permit a third power to levy a revenue upon British goods passing from the manufacturer to the purchaser in the interior of Europe, in direct opposition to the declared principle of the Congress of Vienna? This is not a question of place, or power, or party. It is one which will take its page in the history of this country, when the character and conduct of the administration of that period can neither be exaggerated nor concealed. The declaration of the Duke of Wellington at the Congress of Verona in 1822 is matter of history. The distress, the suffering, the state which language cannot adequately express, of our manufacturing interest and population, at, before, and since that period, is also matter of history—of lamentable history. The ministers of that period, whether they be men in power or out of power, have their historical character to rescue from the imputation of having grossly neglected their duty to the country in its hour of distress, even when called upon by the energetic and just declaration of their plenipotentiary at Verona in 1822, “that the government of the Netherlands has thought proper to close the mouths of the Rhine against the commerce of the world.”

ON PREPARING LARGE TREES INTENDED TO BE TRANSPLANTED, BY CUTTING OR SHORTENING THEIR ROOTS. *By Mr MACNAB, of the Royal Botanic Garden, Edinburgh.*

THE removing of large trees has of late attracted considerable attention. In fact, so much has been written on the subject, that it may probably appear that little now remains to be said. It seems to me, however, that much is yet to be learned in this single department of arboriculture, and that service is rendered to the art by any one who will communicate observations tending to increase the success, and diminish the expense, of the operation.

The subject of this paper is to point out what observation has taught me to consider the best method of preparing the roots of trees previous to removal.

In transplanting large trees, that is, trees of about three or four feet in circumference at one foot from the ground, and about thirty-five or from that to forty feet high, it is a pretty general practice to have the roots cut to a certain distance from the stem of the tree, a year or two previous to removal. This I consider a most excellent practice, which should be adopted in all cases where time is allowed, or where the operation is contemplated a year or two beforehand.

I am aware that it is a very general opinion, that the chief advantage which a tree derives from having its roots cut previous to removal (in the way I shall hereafter mention), arises from the encouragement thus given to the formation of young roots or fibres, and that these young roots or fibres being preserved to the tree when removed, act like so many mouths to take up the proper food for the subsequent nourishment of the tree. Now, I think I shall be able to show, that whatever advantage trees may derive from these new formed roots (an advantage which we may perhaps be forgiven for thinking overrated, when we reflect upon the injury they must sustain in the removal of a large tree), there is another consequence of the mutilation, the importance of which has been overlooked. I am strongly inclined to think, that the principal advantage which a

transplanted tree derives from having had its roots cut or shortened a year or two before removal, has proceeded from the check thus given to its growth, by which it had been brought from a vigorous to a more stunted state.

Every tree must receive a check when transplanted, and that check is less injurious if inflicted gradually. This observation, however, I mean only to apply to large deciduous trees, such as I have mentioned; for small plants, whether in a stunted or a vigorous state, may (if the directions I have given in my *Treatise on the Cultivation of Evergreens* be attended to) be removed with so much care,—the whole operation being perhaps completed in a few minutes,—that the young roots may be preserved perfectly entire, and therefore must be of advantage afterwards.

It is of little importance at what season trees are prepared by having their roots cut; any time between the fall of the leaf in autumn and spring will answer.

I will now point out the different methods practised in preparing trees for transplanting, and comparing the one with the other, endeavour to show which of them is the best. I will, at the same time, endeavour to impress the reader with the belief, that the idea which I have thrown out, of the advantage derived from checking the vigour of a tree previous to transplantation, not only possesses some interest in a speculative point of view, but may be made to affect the economy of the process, and to correct some measures which have been recommended, but which I think very injurious.

First, with regard to economy.—This can easily be made the subject of experiment. Let three trees of the same kind, and as much alike as possible as to age, size, health, situation, soil, and exposure, be selected, each about 3 feet in circumference at a foot from the ground, and from 35 to 40 feet high.

Let a trench 18 inches wide be cut round each, at the distance of 8 feet from the stem, and down to the subsoil, so as to divide every horizontal root at the inner side of the trench. Let this trench be left open in the first tree till the period of transplanting, but in the other two let it be filled again with the earth which had just been taken out of it. At the period of transplanting let the three trees be removed with equal care, and

planted in similar situations and soils, the whole operation being conducted in the same manner, with this difference only : In the first, let any new roots which may have formed at the cut extremities, in consequence of earth having accidentally fallen into the trench, be disregarded ; in the second, let all the new roots which have formed in this situation be cut off ; in the third, let them be preserved with as much care as possible. At the end of two or three years,—and we can rarely judge sooner of the ultimate success of our operations,—we shall find the whole to have succeeded alike ; and it is evident that the first and second will have been removed with a saving of labour, and therefore at a cheaper rate, than the last.

The length of time which should be allowed to elapse between the cutting of the roots and the transplantation, will vary with the season ; after one wet season the trees will be as fit for removal as after two dry years.

My observations apply only to the roots formed at or near the cut extremities of the old roots. Every judicious operator will leave as large a mass of undisturbed earth about the roots towards the stem as can be got to adhere during the operation ; and in trees of the size of which I am now treating, this will be a ball of from four to six feet in diameter.

It often happens that large trees are transplanted, and successfully too, without any previous preparation, and this is done at the same expense as the tree first mentioned in the above experiment ; but, in general, the same success will not follow as where the roots have been shortened, and therefore this should always be done when there is sufficient warning of the intention of removal.

In proposing the above experiment, I have mentioned three methods of preparing the roots of trees previous to transplantation : other two have been recommended ; the first of which I consider bad,—the second worse. This leads me to the *second* application of the principle with which this essay began ; namely, *to correct some methods which have been recommended, but which I think very injurious.*

The two methods which I have now to mention, consist in the application of manure to the roots of the trees previous to their removal. In the one method, the trench cut round the

tree is directed to be filled up with good prepared compost ; in the other, where the branches are fewer than could be wished to form a handsome top, and the roots long and scraggy, we are directed to lay well prepared compost on the ground all round the stem, and as far as the roots extend, to the depth of one foot at the stem, and six inches at the extremities of the roots. These two methods are mere modifications of each other, and are only bad in a greater or a smaller degree, because they produce a greater or a smaller degree of luxuriant growth in the roots, and therefore a greater or a smaller excess of vigour in the tree, at the very period when I am persuaded its growth ought to be checked, and when we take one step to do so by cutting its roots.

Both methods are bad, but the last, as being very expensive, and productive of the greatest growth in the rootlets, ought especially to be condemned.

By it the constitution of the tree will be brought into an artificial state, in which it will be much less able to bear the shock of removal than if it had been let alone. I do not intend to say any thing here on the treatment and care that trees of such magnitude should receive after they have been transplanted. I may mention, however, that a similar practice to the one last noticed is an excellent one for trees after they have been removed ; but this should not be continued for many years after transplanting, for even then the tree would be thrown into an unnatural state of growth, which it could not continue, unless this top-dressing could be repeated from time to time, which would be both unnecessary and expensive.

This top-dressing after removal should never be continued longer than till the tree is brought to the state of health and vigour, which we are entitled to expect the soil and situation in which it is placed are capable of sustaining afterwards.

There cannot be a doubt that a tree taken up and transplanted without any previous preparation (even although the roots and branches are deficient), will make a better appearance at the end of four or five years after removal, than one that has got the top-dressing will do in the same period, supposing all other things alike both in transplanting and in subsequent treat-

We may be assured that it is a good practice to starve and stunt trees before removal, and to feed and encourage them for a time after they have been transplanted.

Many examples might be stated to prove that the principal advantage derived from cutting the roots of a tree some time previous to its removal, is the consequence of checking or stunting it in its growth, rather than of providing it with young roots.

I shall state one or two examples which are of pretty frequent occurrence, and which I am confident are quite consistent with good and judicious practice.

When we wish to take up a plant that is growing in the open ground to put into a pot or tub for any particular purpose, and when the plant is in a vigorous state of growth at the time, the common practice is to open a narrow trench and cut the roots at some distance from the stem, if the plant be large; or, if the plant be small, to cut the roots with the spade, without removing any of the earth, at such a distance from the stem, as will not give the plant too sudden a check. This should be done if possible in a dull or cloudy day. The plant should be allowed to remain in this state one, two, or three weeks, according to its size and nature, and then taken up and put into a pot or tub. This may be done without the plant losing a leaf. If the object of removing the plant into a pot or tub be to exhibit its flowers (as it commonly is), the plant will flower as well as if it had not been removed.

But if a similar and equally vigorous plant be taken up at once, without having its roots previously cut, it will scarcely be possible to prevent its suffering considerably; and it often happens that most of the flowers drop off, and scarcely any of them expand. Now this difference can only arise from the first plant having been checked in its growth,—not from any advantage which it could derive from the formation of young roots between the preparation of the plant and its removal, because the roots are scarcely ever cut so short at first as to go into the pot, lest the check should be too sudden, but require either to be shortened a second time, or bent round in the inside of the pot; and even in this last case it is hardly possible

to preserve any tender rootlets which may have been formed at or near the extremity of the old roots.

The principal advantage of following this practice (which I know from experience to be a good one) must therefore arise from checking the plant in its growth before it is taken up. The same practice is adopted in removing to pots or tubs plants which grow in a conservatory. In this case the plants are generally in a much more vigorous state than those in the open air; and, therefore, when they are of any considerable size, it often happens that it is necessary to cut the roots twice before removal, the second cutting being nearer the stem than the first. By this means, the plants are brought from a vigorous to a more stunted state of growth, and may be removed with perfect safety without even dropping a leaf, although not a young root formed at or near the extremity of the cut roots can be preserved. If such plants, when in a state of vigour, be taken up at once, without any previous preparation of their roots, it is scarcely possible to effect the removal without losing a great part of the young shoots, and probably most of the leaves.

I shall take another example to show the advantage of checking plants gradually, and stunting their growth previous to removal. We know that certain plants which grow naturally in the earth may, if gradually removed from it, be suspended in the air, where they will live for years, with no other nourishment than that which they derive from the absorption of water sprinkled on their surface. In this situation they form no new roots, and those which they had originally, after two or three years, assume the appearance of leafless branches. Nevertheless, if these plants be again placed in the earth, they will soon acquire as great vigour as ever; and this alternation may with caution be many times repeated. But if we suddenly, while the plant is in a state of vigorous growth, deprive its roots of earth, we very speedily kill it.

Were it necessary, other facts might be adduced to prove that at least one great advantage of cutting the roots of large trees previous to removal is derived from the check thus given, and, by consequence, that every measure taken to promote that vigour previous to removal must be injurious. These examples would

show, that some overvalue the importance of preserving the young roots, made at the cut extremities of the old. It has been recommended to cut these entirely away at the period of transplanting, from an apprehension that, as they cannot survive the injuries which they must necessarily sustain, their decay may be injurious to the tree in its subsequent growth. I cannot go quite so far as this; but if I have been able to show that their value is overrated, it would follow that the operation of transplanting large trees may be cheapened by disregarding the roots formed in this situation.

ROYAL BOTANIC GARDEN,
EDINBURGH, 24th December 1830.

REMARKS ON CERTAIN STRICTURES ON HIS TREATISE ON
PLANTING. *By Mr CRUICKSHANK.*

To the Editor of the Quarterly Journal of Agriculture.

YOu will doubtless recollect having reviewed, in your ninth Number, a treatise, entitled "The Practical Planter, containing Directions for the Planting of Waste Land, and the Management of Wood; with a New Method of rearing the Oak." The same work (of which you will recognise the author's name in the signature of this letter), has subsequently had its merits examined by Mr Loudon, in the twenty-seventh Number of his "Gardener's Magazine." Permit me, through the medium of your Journal, to lay before your readers some observations on that gentleman's criticism. If your object be, as it assuredly is, to encourage the useful arts, your wish must be to render justice to those who cultivate them. While I trust, therefore, that you will not refuse me the privilege of defending myself against an unjust attack, I entertain the hope that my remarks may prove of interest to some of your readers, as showing the nature and tendency of what, amongst a certain class of writers, is called *reviewing*.

In his notice of the Practical Planter, Mr Loudon has accused me of having, in that work, made false pretensions to origi-

nality, as well as of misrepresenting certain passages in his *Encyclopædia of Gardening*. To the reasoning by which he endeavours to substantiate these two charges, I shall chiefly confine my attention, glancing, however, if space permit, at a few more of his allegations.

The principal ground on which Mr Loudon endeavours to convict me of putting in false claims to originality, is, that I have applied the epithet "*New*" to my mode of cultivating the oak. "What Mr Cruickshank calls a new method of rearing the oak," says he, "is planting the acorns in plantations of pines, firs, or other trees, of three or four years' growth, in order that they may be sheltered during their infancy,—a very excellent mode, and particularly well adapted for the north of Scotland; but which, as it has been long practised at Walbeck in Nottinghamshire, and in the New Forest in Hampshire, is at least not new in England."

This, Sir, is the argument by which Mr Loudon proves that my system of culture for the oak is not new on the other side of the Tweed. Our critic, however, has in this instance had recourse to a little sophistry. What he represents here as my method, is, in fact, but a part of it. He has taken the liberty to remodel and divest it of its peculiarities, in order to show that its pretensions to novelty are unfounded. Allowing me a similar freedom, I could prove most conclusively, that the agriculture of Scotland, at the present day, is conducted on exactly the same principles as it was a hundred years ago. Leaving out of view the innovations that have taken place during a century in the rotation of crops,—taking no notice of the introduction of the turnip-husbandry,—and passing over in silence other trifling improvements of a similar kind,—would it not be plain, that our farmers now cultivate the earth in precisely the same style as their great-grandfathers did, because, in common with their venerable ancestors, they make use of ploughs, harrows, and dungforks, and, like them too, sow oats, barley, and wheat? To plant acorns in the mode described by Mr Loudon, is indeed a feature of my system, but it is only a single feature; and it is just as absurd to identify the Walbeck method and it, because they happen to agree in this solitary characteristic, as it would be to pretend that the *Encyclopædia of*

Gardening and that of Agriculture are one and the same work, because they are both ponderous volumes, and respectively crammed with the pillaged sentiments of a hundred different authors.

I would put the following questions to Mr Loudon. Do the people at Walbeck and the New Forest plant the nurses for their oaks in the way I recommend? Does their mode of preparing the ground for the reception of the acorns coincide with mine? Is lime used in the operation, and in the manner and quantity I specify? Is their management of the trees, after planting, agreeable to the maxims I have laid down? And, finally, Do they conduct all these processes at an expense in accordance with the estimate I have given? If Mr Loudon can, consistently with truth, answer all these questions in the affirmative, then the originality of my mode of culture, in so far as respects England, falls to the ground. But that gentleman knows well he cannot do this. Let, then, the reader judge for himself regarding the justice of my claims, and the fairness and accuracy of Mr Loudon's criticisms.

Not satisfied with attempting to dash the pretensions of my *New Method* to novelty in England, the ingenious critic next proceeds to show, first, "That there is nothing new among *Scots authors* in the *proposal* to raise oak woods from the acorn;" and, secondly, "That there is nothing new in *Scots practice*" in *actually doing so*. Here he buckles on his armour to fight a shadow; for all that he contends for I grant, as may be seen at page 209 of the *Practical Planter*. The use of acorns instead of plants from the nursery, is, I must again repeat, but a single feature of my plan; and to represent this one trait as the whole system, is just about as reasonable as it would be to assert, that the human body is composed wholly of great toe, or that a horse has nothing about him corporeal besides his tail. Yet it is but in this solitary circumstance that my method of rearing the oak, and that proposed or practised by others, as an improvement on the general mode of Scottish culture, have the least appearance of affinity. Were it worth while, it could easily be shown, that even the bare planting of acorns is far from being so generally practised in Scotland up to the present day, as Mr Loudon would convince his

readers; and that it was extremely little known at a period so recent as when Dr Yule wrote on arboriculture, is plain to a demonstration; else what could have moved that gentleman to recommend it as a principle which, though good, was little understood or acted upon? Letting this, however, pass as a matter in which I am not concerned, I may say to Mr Loudon, in reference to one of the testimonies which he produces against me, "Out of thine own mouth will I condemn thee."

In order to prove that my system was well known in Scotch practice long before the Practical Planter made its appearance, Mr Loudon refers his readers to his *Encyclopædia of Gardening*, Art. 6828. Now, on referring to this authoritative passage, what does it turn out to be? An account of Scotch practice, proving clearly the said practice and the Practical Planter's method of rearing the oak to coincide? By no means. The passage turns out to be, not a description of any practice whatever—not a system of culture relating specially to the oak, but a confused discussion, a parcel of contradictory sentiments, copied from near half a score of different writers concerning the question, *Whether trees in general ought to be sown or planted?* In this grave debate, one author says one thing—another, something else,—and several appear to doubt what it may be proper for them to say. The best of all is, that Nicol, from whom "E. D. G.," the coadjutor of Mr Loudon, in writing the review of my work, accuses me of having stolen my system of oak culture, is here represented as an advocate for planting in preference to sowing! Another authority, which is triumphantly quoted against me, is the General Report of Scotland, vol. ii. p. 269, which tells us, as quoted in the *Encyclopædia of Gardening*, that there are some rare instances in Scotland of "promising oak plantations, from oaks dibbled into soil altogether unimproved." What resemblance Mr Loudon saw here to my system, I am utterly at a loss to conjecture. Did he review my book without reading it, or did he write under the conviction that the unfortunate volume which he thus misrepresents never had been, and never would be, opened by a single individual who reads his Magazine? Yet this last reference is not much farther out of the way, than the assertion that the system of Dr Yule and Mr Sang is coincident with mine. They recommend ploughing or

trenching for the reception of the acorns *. I do neither. Their plan is inconsistent with having nurses previously on the ground,—mine the contrary. Their mode of proceeding is in many situations impossible,—that of the Practical Planter never. These antitheses embody important discrepancies between the two modes of culture, but none more so than the fact that mine may be conducted at one-tenth the expense of theirs. What a correct opinion they must have of books, who trust to the accuracy of such reviewers as Mr Loudon !

But I must leave this topic, and proceed to examine the charge preferred against me by Mr Loudon, of misrepresenting his *Encyclopædia of Gardening*. In one of the instances of which he complains, I have said, in reference to that work, that it directs the seeds of the spruce, larch, and Scots fir, to be covered half an inch deep. I have here fallen into a small inadvertence, which consists in having comprehended the larch with the Scots fir and spruce. The mistake arose from my depending on memory, and not having Mr Loudon's work before me at the time of writing. As it was therefore a mere oversight, I cannot charge myself with unfairness, as he very unceremoniously does, in having admitted it, though I pledge myself to make the due correction in the next edition of my work. At the same time, I am extremely glad to find, that my notice of this passage of the *Encyclopædia* has invited Mr Loudon to make inquiry at Mr Reid of Aberdeen, Mr Gorrie, and other respectable nurserymen, regarding what is the true depth of covering to be applied to the seeds of firs, as well as to plead guilty of entertaining and propagating a very pernicious error, touching the nursery culture of these trees. A covering of half an inch, either for Scots fir or spruce seed, is the most they can bear, in the driest seasons and most friable soils. In light land in a moist season, and in land of a binding quality any season, the seeds, or a great part of them, will be entombed by such a depth of covering to see the light no more.

But Mr Loudon brings another charge of misrepresentation

* I have not at this moment access to the works of these two gentlemen, and I merely infer their practice to be as I have stated it, from a few somewhat ambiguous hints in the *Encyclopædia of Gardening*.

against me. I have said (Pract. Plant. p. 32), that in giving directions for the formation of a nursery, he "recommends that earth should be forced." In a marginal note on these words, the following statement is made, in order to prevent misapprehension on the part of the reader: "I have here given the sense of Mr Loudon's words in the technical language used among gardeners in Scotland. When mould is brought from a distance, to alter or improve the character of any piece of ground, this is called forcing of earth." However clumsily, therefore, I may have expressed myself, the meaning of my words, taken altogether, is simply that Mr Loudon's directions *imply* the "forcing of earth," according to the definition of that practice which I have given. Now that this is the truth, and nothing but the truth, I think the following observations will evince.

In the *first* place, the author of the Encyclopædia recommends as the most eligible of all situations for a nursery, such a piece of ground as is well qualified for a kitchen-garden. But according to the same authority, in forming a kitchen-garden, if the soil be not naturally of a certain depth, which is specified, "proper earths and composts should be incorporated with it," a practice which coincides exactly with my definition of "forcing earth." From such premises as these, no one surely can be justly accused of misrepresentation in drawing the conclusions which I have done, and at which Mr Loudon is so indignant. But, passing over this argument, I am acquitted of the charge which the critic brings against me by the passage in the Encyclopædia of Gardening, which specifically states what depth the soil of a nursery ought to be. We are there told, that for a complete nursery, the ground should be 18 inches or 2 feet deep, and moreover, that it should be of three distinct qualities, *light* and *friable*, *clayey*, and *mossy*. Now this implies "forcing" plainly and incontrovertibly, in ninety-nine perhaps out of every hundred cases. To say nothing of the rare occurrence of pieces of ground which extend only to a few acres, containing in that limited area three such different kinds of soil as sand, clay, and moss, 18 inches or 2 feet of mould above the subsoil, indicate a description of land not found naturally in Scotland; and, so far as my information

extends, not even in England, but in spots few and far between, and these celebrated for their exuberant fertility. That in the kitchen-garden, and orchard grounds of gentlemen's seats, as well as in the vicinity of great towns, land may be occasionally found deeper even than 3 feet, is not denied. But examples of this kind are not to the purpose. They are in fact the result of "forcing," designed or accidental; designed, in the case of gardens and orchards; accidental, in regard to land in the neighbourhood of large towns, where it is often necessary to get rid of the earth produced in making excavations for buildings and other purposes, by spreading it on the neighbouring fields. If a person in laying out a nursery, happens to pitch upon a piece of ground bearing either of these descriptions, I am ready to grant that he will not need to "force earth," taking even Mr Loudon for his guide; but this arises solely from the circumstance that the operation has been already performed.

Thus, I think, the precepts for the formation of a nursery contained in the *Encyclopædia of Gardening*, very clearly imply forcing, in the sense in which I have employed the term. In a letter of mine to Mr Loudon himself, he had seen an explication of these precepts, similar in substance to the above, before he wrote his review of the *Practical Planter*; and, from this circumstance, the following strange piece of logic may perhaps be accounted for. After accusing me of gross misrepresentation in saying that he recommends the forcing of earth, he proceeds to repel the charge by the following commentary on what he has advanced on the formation of a nursery in his *Encyclopædia of Gardening*. "We treat," says he, "of a *complete nursery, a private nursery, and public nurseries*." He then recapitulates the respective qualities of land which he pretends to have assigned to each of these in the *Encyclopædia*, and insinuates that I have mistaken his meaning; and concludes by asserting that I have conjured up the forcing of earth in my imagination. Now, I would just ask Mr Loudon, how he thinks that, by means of this preposterous division of nurseries, he can clear himself of the error of which I have convicted him? He pretends, that when he recommended soil of 18 inches or 2 feet deep, he was speaking of a complete nursery. Be it so; but what is this complete nursery? It

must be neither public nor private to be of any service to Mr Loudon's argument; and if this be the true definition of it, it is something very hard to be conceived. It is easy to form a conception of a nursery, either public or private, which is complete in its kind; but to attain to any tolerably clear idea of the converse, that is, of a nursery complete in its kind, but which is yet neither public nor private, is quite another affair. A private nursery, according to common ideas, is one in which the proprietor raises plants for his own use, and not for sale. A public nursery again is one in which the owner raises plants for the use of all who may choose to purchase them. These are quite clear and intelligible definitions; they may be comprehended by any one. But what ordinary mind can form any notion, clear or dim, of Mr Loudon's "complete nursery"—a nursery where plants are to be raised indeed, but neither for the owner's use nor that of others—neither to be sold nor yet remain unsold? I submit to any one who can judge without prejudice, whether the attempt on the part of my accuser to convict me of misrepresentation, by this incomprehensible division of nurseries, is not of itself proof sufficient of my innocence.

It may be proper here to call the attention of your readers to a feature of Mr Loudon's nursery culture, which I omitted to notice in the *Practical Planter*. At page 975, art. 6989, of the *Encyclopædia of Gardening*, we are informed that the soil intended for Scots fir seeds should, before it is dug over in February, be *thickly coated with rotted hot-bed dung*. The same management is prescribed for the other species of firs. Now, keeping in mind that the land to which this "thick coating" is to be applied is "18 inches or 2 feet deep," that is, of the highest natural fertility; and moreover that Mr Loudon tells us it must be put in good heart the previous season, I think that gentleman stands convicted of advocating "the forcing system," towards which he professes so great abhorrence, upon evidence as good as any which he can produce to prove that he is editor of the *Gardener's Magazine*. By such treatment, wheat or any other kind of grain would be not merely forced, but overforced, as every one who has any skill in agriculture will be ready to testify. How much more, then, firs, which come to perfection in soil too poor for the production of oats, of wheat, of barley,

or any other variety of grain whatever. But Mr Loudon would, I verily believe, resent any insinuation that he was a friend of forcing, had he recommended firs to be raised on a hot-bed under glass.

The length to which my remarks have already extended, will not permit me to bestow much notice on the other features of Mr Loudon's criticism. He has in the course of it bestowed a good deal of praise, which, as coming from an enemy, may be considered as merited. I have, "on the whole," he says, produced a useful practical book; I have furnished the best and most original argument for planting waste land he has ever seen. My rule for pruning is the best that has ever been given; and had I been less bulky, put forward no false pretensions to originality, and not misrepresented the *Encyclopædia of Gardening*, the work "would have merited unreserved commendation." This is all very good; and, taking away the three exceptive clauses, would make an imposing figure at the tail of an advertisement. The critic has, however, taken care to place all that is favourable in his review beyond the reach, it may be presumed, of the majority of his readers. Taking advantage of that innate laziness which dissuades most people from perusing more than a page or two in any single article of a dull magazine, he has employed an assistant to write an introduction to his own criticism, containing all that is damnatory in the latter, but admitting none of its laudatory clauses. I at first supposed, that, in adopting a measure so unprecedented, as to employ a plurality of labourers in manufacturing the same critique, Mr Loudon had merely wished to prove by actual experiment, how far the division of labour might be applied with success to reviewing. On second thoughts, however, I was compelled to relinquish this idea, by the very plain inference, that had an experiment of this kind been all that was intended, each workman would, as in pin-making, have confined his attention to a single department. Unmingled praise would have flowed from the quill of Mr Loudon, and the unsweetened gall of vituperation distilled exclusively from the pen of his coadjutor. Or, supposing each to have taken the part here assigned to his co-operator, we should then have had Mr Loudon pouring forth censure, unadulterated with any foreign admixture; and

E. D. G. exuding commendation as smooth and free from asperity as olive-oil. But though the last-mentioned gentleman is almost wholly vituperative, his employer has by no means confined himself to sentiments of an opposite description. Hence I am under the necessity of attributing the unwonted mode of reviewing, which the conductor of the *Gardener's Magazine* has thought fit to adopt on this occasion, to an amiable desire on his part of concealing from his readers the praise which has unwittingly been elicited from him. The fact that he has placed E. D. G.'s lucubrations before his own, adds strength to an opinion, which is not rendered less probable by the odd reason which he assigns for the relative position he has given to the two parts of the review. His coadjutor's remarks are placed first; forsooth, because they came to hand after his own were written. Does Mr Loudon always act on the principle of making the "last first, and the first last?"

With the remainder of my remarks I must be extremely brief. The worthy critic insinuates that certain chapters of the *Practical Planter* belong not to me, but to some Edinburgh editor. Something peculiarly *attic* about these chapters may have caused suspicion in Mr Loudon; but his surmise is nevertheless wrong, by the token that I can produce every fragment of them in the original blotted manuscript, which never saw Edinburgh. Some parts of my work appear to him to have a bookmaking character; and, in order to show that he has a right to judge on this point, he speaks of himself as knowing "something of the trade." If he means the trade of bookmaking, his pretensions, I make bold to say, are founded on a rock. But he talks too modestly of his science when he intimates that he knows only something; he might with perfect truth have averred that he knew an immense deal. I, for my part, have no hesitation in allowing him the praise of being the greatest bookmaker of the age. No one can read a few pages of any of his voluminous publications, without seeing at once that he is an adept in the business. His *Encyclopædias* show, that one who is a master in the craft may publish the most ponderous tomes without employing his brains at all,—without even being at the expense of a pen, farther than is necessary for dashing off the title-page and preface. The scissors are the great instrument in the hands of such an expert

tradesman as Mr Loudon, and with these he can accomplish feats which are truly astonishing. By means of the scissors an author may be gutted of his choicest contents in a few minutes—a labour which it might require days to accomplish, by merely copying with such a lubberly tool as a pen. By means of this instrument, a single bookmaker may keep a press going for years together, without the printer's devil being ever once sent away without copy. By means of it, in fine, any thing short of miracles in the way of authorship may be achieved. The scissors, however, sometimes commit sad slips in the hands of even the most skilful operators. Many examples of this occur in Mr Loudon's own works, but I shall only give two instances. In cabbaging an account of the boar from some naturalist, our *author* has allowed his instrument to intrude on a paragraph relating to the bear, a circumstance which may lead some of his readers to suppose that the two animals are one and the same. By a similar mistake, he has furnished sheep with an appendage which Nature certainly has not given them, namely, *claws*. Some people may think this strange in the editor of a Magazine of Natural History, but they should remember that the most expert tailor will at times cut his cloth a few inches longer than is necessary.

I have thus, Sir, endeavoured to do justice to Mr Loudon as a reviewer. Much more I might have said, but I was unwilling to incur the risk of being excluded from your pages, on the score of unreasonable length. Hoping that you will spare room for my remarks in your next Number, I have the honour to be, &c.

THOS. CRUICKSHANK.

CARESTON, 22d Dec. 1830.

{ We have afforded Mr Cruickshank the opportunity he has required of defending himself against what he conceives to be an unjust attack. In our former Number, we referred to his work on Planting, with the approbation which we conceived it to deserve, and with that feeling towards merit and talent like his, which it will, in all cases, be a gratification to us to evince. In the same review to which Mr Cruickshank objects, we find something like a reflection upon ourselves, on which, how-

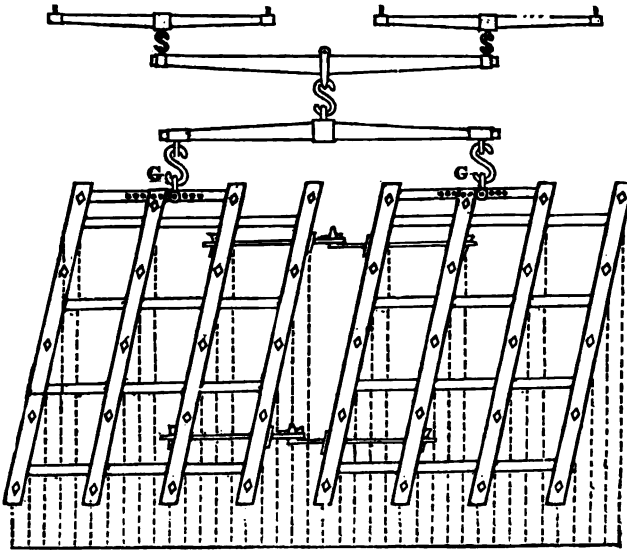
ever, as it is without any apparent cause, or even meaning, we need not make any grave comment. Mr Loudon accuses us of entertaining some "prejudicial feeling" connected with the subject of planting. We presume that either the printer or the scissars have committed some mistake. It is more pleasing to us to be able to state, that having apprized Mr Loudon that Mr Cruickshank had announced to us his intention to reply to the somewhat questionable criticism of himself and his friend Mr E. D. G., he offered at once to allow Mr Cruickshank to insert any answer he might think fit in the *Gardener's Magazine* itself—a trait of candour and good feeling in Mr Loudon, which deserves to be appreciated. We avail ourselves, at the same time, of this opportunity of correcting a misapprehension which Mr Loudon has pointed out to us. In our recent notice of Mr Macnab's work, we quoted that gentleman as commenting on certain absurd practices recommended in the planting of evergreens,—namely, that the roots should be well dried, and that the planters need not be too nice in the operation. Mr Loudon mentions, that this remark, which was contained in the *Kalendarial Index* of the *Encyclopædia of Gardening*, was meant ironically. It is quite fair to admit of this explanation. It is impossible to suppose that Mr Loudon intended this remark otherwise than as a hit at ignorant and careless planters.—ED.]

ON THE CLASS OF INSTRUMENTS TERMED GRUBBERS OR CULTIVATORS.

IN a former Number of this work, we described the form, and explained the mode of action, of the harrow—an instrument in universal use in tillage, and of which the purpose is to pulverize the ground which has been turned up by the plough,—to disengage from it, and collect the weeds and roots which it may contain,—or to cover the seeds of the cultivated plants. We showed that the common rectangular harrow is in this respect

defective,—that the teeth do not indent the surface of the ground at regular distances; some of them following nearly in the same line, while, in other cases, the intervals are large and irregular. This indeed arises not so much from the form of the harrow, as from the manner in which the draught is attached to it. But even when the draught is attached in a proper manner, the rectangular form of the harrow, as we endeavoured to show, is attended with certain inconveniences in practice, which may be remedied by rendering its form rhomboidal, as shown in Fig. 1.

Fig. 1.



By adopting this principle of construction, it will appear that the animals of draught move abreast, and exert an equal force in pulling, while the teeth indent the surface of the ground at equal distances, as may be made apparent by drawing lines from the centres of the different teeth parallel to the line of motion.

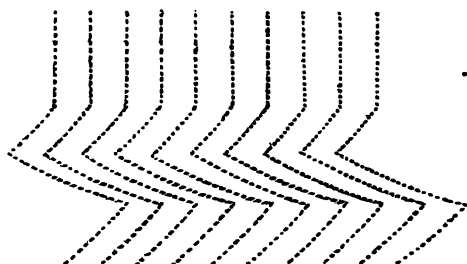
The advantage of this form of the harrow, as compared with the common form, is, that the teeth penetrate more into the ground, and that the instrument is moved by a less force of draught.

It must at the same time be observed, that, in certain cases,

the more steady motion of the rhomboidal harrow is less suited to the operation to be performed, than the irregular motion of the common harrow, which being attached to the draught at one point only, is more tossed and shaken when passing over rough or uneven ground.

There are two cases in which this shaking or lateral motion is useful. The first is when the seeds of plants are to be covered. In this case, the object is to give as great an agitation as possible to the upper particles of the soil, and then it is not necessary that the teeth of the harrow penetrate far into the ground; but it is important that the different teeth pass over as much of the surface in the same time as possible. This will be illustrated by inspecting the following figure (Fig. 2.), exhibiting the different effect produced by the teeth when they have a steady, and when they have a lateral motion.

Fig. 2.



The second case where the lateral or shaking motion is useful, is when the surface is covered with large clods, bound together by the roots of plants. In this case the teeth, being constantly forced out of the direct line of motion by the obstacles which they encounter, and so constantly exerting a considerable force to regain the equilibrium, beat or strike the clods of earth upon the surface, and thus tend to break them, and disengage the roots and stems which bind them together. On rough, turfy, or cloddy ground, therefore, as well as when the sole purpose is to cover seeds, the lateral or shaking motion of the harrow is advantageous. But, upon the whole, as a general instrument of tillage, the rhomboidal harrow must be considered the more perfect and efficacious; and quite a sufficient degree

of lateral motion may be given to it by shortening the posterior swingle-tree, and bringing the two points G, G, in Fig. I. very near to each other.

There is one purpose, however, for which the harrow is an imperfect and inefficient instrument, of any form of which we are able to construct it. This purpose is the pulverizing the soil, and dragging up to the surface the roots of weeds which it may contain. The teeth of the harrow, being forced into the ground solely by their own weight and that of the frame-work in which they are fixed, are not well calculated to penetrate into it, and are constantly thrown out by the obstacles they encounter. In firm clays, or cloddy ground, therefore, the impression made by the teeth of the harrow is often seen to be extremely superficial. Were the teeth formed somewhat like the coulter of a plough, and curved like it forward, they would better insinuate themselves into the ground, and be less liable to be forced out of it when encountered by obstacles. But the harrow, from its nature, does not admit of this construction; for, in this case, the teeth would form an angle with the frame-work in which they are set. The weeds and rubbish disengaged from the ground would be collected at the angle, and would thus be carried along with the harrow and impede its progress; while this form of construction would add to the difficulty of freeing the teeth from the rubbish collected.

To obviate these defects of the harrow in the tilling of the soil, a class of instruments has been employed, intermediate in their operation between the harrow and the plough, and partaking more of the properties of the latter than of the former, termed Grubbers, Cultivators, Extirpators, &c. These instruments, in their improved form, are of more recent introduction into agriculture than either the plough or the harrow *.

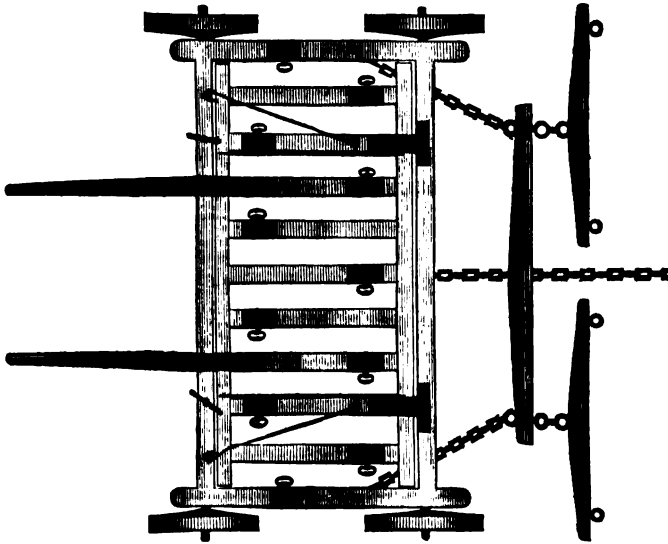
Various instruments of this kind, more or less useful or ingenious, have been constructed in England and Scotland; such as Parkinson's Cultivator or Scarifier, Weir's Improved Cultivator,

* An instrument, indeed, was in use amongst the Romans, similar in the purpose for which it was intended. It was termed *urpis* by Cato, and *irpes* by Varro and more recent writers. It is described by Varro as a plank with teeth for pulling roots out of the ground, and as being drawn by oxen as a wain.

vator, Hayward's, Beatson's, and others. But those which it is proposed to notice here are the Scotch Grubber, Finlayson's Patent Harrow, and Kirkwood's Grubber.

The Scotch Grubber, Scarifier, or Cultivator, as shown in Fig. 3., consists of a rectangular frame of wood mounted upon

Fig. 3.



four cast-metal wheels 20 inches in diameter. Within this frame are two bars running the breadth of the instrument, into which are mortised nine other bars about 8 inches apart from centre to centre. One coulter is fixed into each of these and the end bars of the outside frame, making in all 11 coulters. Around the openings for these coulters, above and below, are plates of iron for strengthening the wood, and with bolts firmly fixed to steady the coulters when the machine is at work. These bolts are attached by chains to prevent them from being lost, should they happen to drop out. By means of the bolts the coulters can be set to any depth required. When the machine is to be removed from one field to another, the coulters in the ends of the outside frame are lifted up to the top by shifting the bolts. The inner frame is then lifted up by means of the handles, and is supported by the small iron stays, as shown in the dotted

lines in the profile view, Fig. 4. The coulter stand inclined

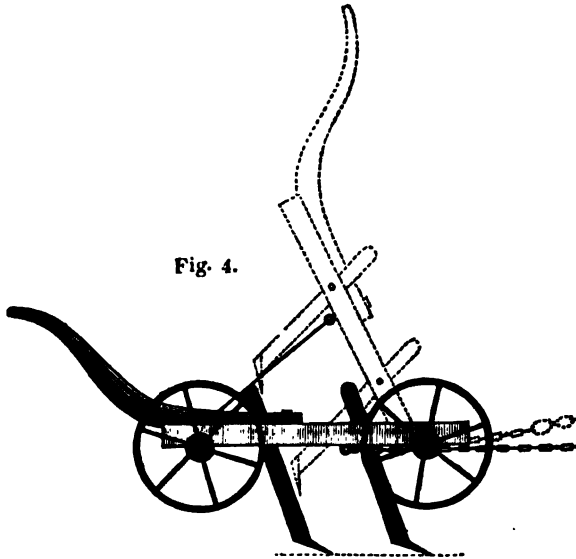
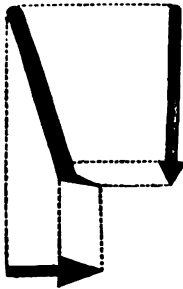


Fig. 4.

forward, and have steeled triangular feet, dipping a little, as shown in Fig. 5. ; from 3 to 4 inches broad at the base, and from 5 to 6 inches long from the base to the point of the triangle.

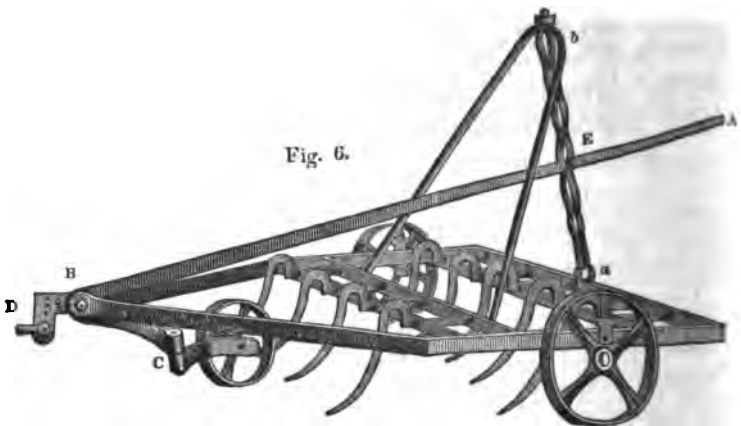
Fig. 5.



This form of the coulter below is undoubtedly an objection. The operation of the coulter is to stir, but not turn over, the ground ; and such an operation of cutting by these broad shares at their lower extremity, where the ground is firm, occasions a useless waste of draught. The size, construction, and weight of this machine, diminish its utility, as, in the majority of cases, it re-

quires to be worked by four horses, a combination of power generally to be deprecated in such machines as inconvenient and wasteful. The waste and inconvenience are experienced in the general work, but especially at the ends of ridges. The machine is also apt to be choked with the roots of weeds, stubble, and the like, on land where these prevail, the confined position of the teeth, and the large frame-work above, tending to retain them. Upon the whole, this is not a good instrument. The price of it is about L. 11.

Mr John Finlayson, formerly farmer at Kaims, in the parish of Muirkirk, Ayrshire, had devoted his attention to the invention and improvement of various instruments of tillage; and one of these falls under our present class,—his patent *Self-cleaning Harrow*, as he terms it. This machine is made wholly of iron. It consists of two parallel sides, with two sets of transverse bars, as shown in Fig. 6. Into the hindmost two of these sets are inserted five double curved teeth or prongs, and into the foremost four prongs. A little before the foremost prongs, the continued



sides converge, so as to meet at the point B, where they are attached by a bolt to the apparatus ADC, consisting of the handle or regulator A, the bar leading to the fore wheel C, and the part D, to which the line of draught is attached; these three parts A, D, and C, being all united together. On the hindmost transverse bar is an upright lateral spring E, consisting of two rods, forming openings, supported by two rods, from the hindmost of the two foremost bars. The regulator is made to

pass through these upright lateral springs. And as the regulator, the point of draught, and the bar leading to the fore-wheel, are all fixed together, or of one piece, it will appear that by raising the regulator (the fore-wheel being always on the surface), the point of draught, and consequently the fore-part of the frame, will be depressed, and the prongs forced deeper into the soil. When the regulator is at the bottom of the upright lateral springs at *a*, the foremost prongs are then lifted out of the ground; and as the regulator is lifted up through each opening, the prongs descend about $1\frac{1}{2}$ inch, till it is up to the top at *b*, which gives the maximum depth, when the prongs will be between 8 and 9 inches in the ground. The hind part of the frame was raised or depressed by means of a screw on the axle of the hind wheels. These were put on, according to Mr Finlayson's original plan of the instrument, at the sides behind the hindmost transverse bar. The length between the fore and hind wheels, however, was found to weaken the machine, and cause it sometimes to have a vibratory motion. To obviate these defects, Mr Kirkwood, an ingenious and intelligent mechanic at Tranent (to whose grubber we shall have occasion to refer) now makes these machines, with the permission of the holder of the patent, with the hind-wheels, as shown in the figure, placed opposite to the upper curve of the hindmost prongs. The axles, by means of a capstan attached to the side-beam, may be elevated or depressed, and thus the hinder prongs made to correspond in depth with the foremost prongs.

The space covered by the prongs of this harrow is 5 feet 4 inches. The length of these prongs is 29 inches; their breadth is $1\frac{1}{4}$ inch, and their thickness is $\frac{7}{8}$ of an inch, except at the point where it is $1\frac{1}{4}$ inch. The weight of the whole machine is about 4 cwt. 1 qr. 10 lb. On heavy lands, or lands which have not been ploughed, this machine requires four horses to work it; and in ordinary cases, with tolerably light land, three horses are required. The price is L. 10, 10s. There is also a smaller and lighter kind of harrow, with 7 prongs, which covers a space of 4 feet. On heavy land this variety of the harrow requires three horses, and on light lands two horses. The price of it is L. 9. Of these two instruments, the larger one is rather the most in repute.

The other instrument of this class to be noticed, is Mr

Kirkwood's grubber, a figure and description of which were given in a recent number of the Highland Society's Transactions. But we are induced again to notice it here, both because it falls within the class of instruments which we are now describing, and because various useful improvements have been made upon it since the original figure and description were given in the Society's Transactions.

This instrument, which is formed wholly of iron, consists of a frame-work, as shown in Fig. 7., in which are fixed seven

Fig. 7.



prongs, or rather blunt coulters, so placed as to move at equal distances from each other, and parallel to the line of motion. The frame-work rests upon three wheels, to the axle of the two posterior of which at BB, are fixed the two guiding handles AA. These handles, which are moveable round the axle at BB, are extended to the cross-bar CC. By depressing the handles they act as levers, of which the fulcrums are BB, and elevate the bar CC, and consequently the posterior part of the frame-work. Further, the part of the machine EF, to which is attached the fore-wheel G, is connected by means of the rods ED, DH, and DL with the handles AA; the same depression of the handles which elevates the hinder part of the instrument, acts upon the upright rods CD, CD, which are moveable round the iron bar CC, at these points. This acting upon the bar at the points CC, moves forward the fore-wheel G, and thus elevates the fore-part of the frame-work, and that in the same degree as the hinder part is elevated. Thus an elevation or depression of the guiding handles elevates or lowers the whole frame-work, and consequently causes the teeth to move at a greater or less depth as may be required. By means of a simple contrivance at the point K, the rod ED is fixed in its position, and thus the whole frame is kept at the elevation required. By depressing the handles sufficiently, the whole teeth may be lifted out of the ground, which is found to be extremely convenient when turning at the end of ridges, and when moving from one field to another, or even when encountering great obstacles in the ground, as stones. The various coulters being also fixed in their place by keys or wedges, may be removed, or set at a greater or less depth as may be required. The space covered by the coulters of this instrument is $4\frac{1}{2}$ feet 4 inches. The coulters are $14\frac{1}{4}$ inches long below the bars; 2 inches broad, or deep; and $\frac{3}{4}$ ths of an inch thick, or across, except at the point, where they are $1\frac{1}{4}$ th inch thick. This cross-breadth at the point, when new, both in these coulters and those of Mr Finlayson's harrow, is, as has been stated, $1\frac{1}{4}$ th inch. But they are soon found, by the greater friction at this part, to wear down to about an inch in cross-breadth, which therefore indicates the proper size of which they ought to be made. The diameter of the hindmost wheels is 22 inches; the weight of the

instrument is about 4 cwt., and its price is L. 10. Two horses are in general sufficient for working this machine*.

Of all the instruments of this class which have yet come under our observation, we conceive that of Kirkwood to be the most ingenious, and the most effective with an equal application of power. The method of raising the coulters out of the ground, by means of the handles,—an operation which can be performed in a moment,—is simple and of great utility in practice. The machine possesses, in nearly an equal degree with Mr Finlayson's harrow, the advantage of not being impeded in its motion by the weeds or rubbish which are collected by the teeth or coulters, while it is superior to the latter instrument from the smaller power of draught required.

The introduction of this class of instruments into tillage must be regarded as beneficial and important. They are highly useful in assisting the operations of the summer-fallow. When land is full of root-weeds, the repeated operation of the plough, the harrow, and the roller, are the methods resorted to for tilling and clearing it; but very frequently, when the land is stiff, even the operation of ploughing itself, tends to compress the furrow-slice, and if the influence of the sun be considerable, it will be formed into a hard mass, on which the subsequent operations of the harrow and the roller have little comparative influence. So much is this felt in many of the stiffer clays of England, that

* To these instruments might be added Morton's revolving harrow, to the particular properties of which, however, we may take a future opportunity of recurring. This instrument consists of sets of spikes or prongs, fixed on an axle, round which they revolve like the spokes of a carriage-wheel. This axle is placed oblique to the line of motion, so that the manner in which the teeth work is of a two-fold nature. They partly revolve, and they are partly dragged, like the teeth of the common harrow. The axle consists of two parts converging towards each other, forming the two equal sides of an isosceles triangle. There are ten sets of teeth in all, five being on each side or half of the axle; and each set contains ten spikes or prongs, like the spokes of a wheel, but curved forwards at the point. The machine moves on two wheels, and requires the labour of four horses. The price formerly was L. 18, 18s. Mr Morton, however, the ingenious inventor of it, so well known in Scotland as a maker of agricultural machines, is now employed in simplifying its construction, both for the purpose of lessening the price and diminishing the draught necessary. We hope to give a description and figure of it in its improved form.

it is a very frequent practice to delay giving the first ploughing to the fallow-land till the month of May, by which one of the great benefits of an efficient summer-fallow is lost. But, by means of a well constructed grubber, such land may be cleaned and tilled without the necessity of turning up a new surface. The instrument, too, can be made to go at any depth in the soil which may be required, and thus the land can either be stirred to the depth to which it had been originally ploughed, or to such depth as may be most suitable for the purpose intended, whether that purpose be to clean the land of root-weeds, or to till the soil only a few inches deep.

Further, the grubber may be employed in preparing land in certain cases for the seed, without the necessity of a repetition of the more costly operation of ploughing. Thus land which had been ridged up in autumn or winter, after having produced any of the leguminous crops, as pease or beans, may be prepared for the seed with advantage by using the grubber alone. In this manner, the seed is sown upon the surface mould which had been pulverized by the influence of the sun and frost. In the case, too, of land which had produced a crop of turnips or potatoes, the grubber may, in all cases, obviate the necessity of a second ploughing as a preparation for the seed; and may even, in many cases where the soil is light and dry, obviate the necessity of ploughing at all after the green crop has been removed or consumed.

In tilling with the grubber, it is frequently found expedient to go twice over the ground; and, in this case, it is proper to set the teeth at half the depth required in the first operation, and in the second operation, to set them at the full depth, and in working to cross at right angles to the first operation. This, with a few turns afterwards of the common harrow, will constitute a very efficient tillage. The use of the grubber in agriculture, it is to be observed, does not supersede that of the harrow, the latter being still employed for the further pulverization of the soil, and for collecting into heaps the weeds and rubbish brought to the surface by the grubber. Although the grubber is in pretty general use in a few well cultivated districts, it is very far from being so generally adopted as it ought to be. Although it may be employed

with the greatest effect on the lighter class of soils, it may be employed on any land, however stiff, provided it is preceded by one and sometimes two ploughings. In comparing the grubber with the plough in point of economy of labour—taking Mr Kirkwood's instrument for example—the breadth of ground covered by it at one operation is, as has been stated, 4 feet 4 inches; and the ordinary breadth turned over by the plough, at one operation, is nine inches. Now, one pair of horses with the plough can, upon an average, turn over one acre of land in a day, and one pair of horses with the grubber, in the same time, and at the same rate, would go over nearly six acres. But, in truth, one pair of horses with the grubber can move at a considerably quicker rate than with the plough; and this illustration is sufficient to show the direct economy of labour which may be effected by the use of the grubber. Besides, however, the mere economy of labour by the employment of this implement, the land can frequently be cleaned and sown much earlier than if the plough and harrow only were employed, and this is an advantage which, as every farmer knows, may prove of great importance to the productiveness of the future crop.

ON THE CAUSES AND PREVENTION OF FOOT-ROT IN SHEEP. *By*
Mr DICK, Veterinary Surgeon, Edinburgh.

THE foot-rot in sheep is a subject of so much importance to the agriculturist, and the disease has prevailed to such an extent during the last two years, that any apology for offering a few remarks upon it would be superfluous. Indeed, its destructive effects are at any time such as to call attention to this subject; and the differences of opinion which exist regarding the causes which produce the disease, the means of preventing it, and the remedies for it, plainly show that the subject is as yet but imperfectly understood.

There are some points of importance to be kept in view, in order to understand properly either the functions of the foot of the sheep, or the nature of the diseases to which it is liable. The foot presents a structure and arrangement of parts well adapted to the natural habits of the animal. It is divided into

two digits or toes, which are shod with a hoof composed of different parts, similar in many respects to the hoof of the horse. Each hoof is principally composed of the crust or wall, and the sole. The crust, extending along the outside of the foot round the toe, and turning inwards, is continued about half way back between each toe on the inside. The sole fills the space on the inferior surface of the hoof between these parts of the crust, and being continued backwards, becomes softer as it proceeds, assuming somewhat the structure of the substance of the frog in the foot of the horse, and performing at the same time analogous functions. The whole hoof, too, is secreted from the vascular tissue underneath. There are, besides, two supplementary digits at the fetlock.

Now, this diversity of structure is for particular purposes. The crust, like that in the hoof of the horse, being harder and tougher than the sole, keeps up a sharp edge on the outer margin, and is mainly intended to resist the wear and tear to which the foot of the animal is exposed.

"In a state of nature," says Mr Wilson, at page 354 of the present volume of this Journal, "the sheep is not less active and energetic than the goat; its dimensions are fully greater, and its muscular strength is at least equal, both in force and duration. It is also an alpine animal, fearless of crag and cliff, and dwelling, indeed, *by preference, among the steepest and most inaccessible summits of lofty mountains*. Among its native fastnesses, it is seen to bound from rock to rock with inconceivable swiftness and agility." And there the construction of its feet, the sharp hard tough margins of the crust, enable it to catch hold of the smallest ridge with the greatest security. In climbing and leaping among rocks, however, in this manner, or travelling on the sides of mountains along the sheep-tracks, its hoofs must be much worn or otherwise destroyed; but, it is found, that the hoofs of all animals, by such circumstances, become possessed of a degree of hardness and toughness which they do not possess under other circumstances. The hoofs of horses, by exercise without shoes on a hard surface, are changed in this way to a certain extent. The hoof is worn away as it grows; but as the consumption is equal to the production, it is always fresh and sound. This is the case with

wild animals, and those of a half domesticated kind are but little changed from it.

But what is the effect of domestication?—What do we gain by enticing the sheep from his native and natural haunts, to the richer pasturage of our meadows or lawns? There the animal enjoys a more luxuriant repast; it fattens to a larger size, and will, in this respect, repay the increased allowance which has been made to it. But, instead of moving about in small troops with the alacrity of the wild kinds, the sheep are seen in flocks of thousands moving slowly over their pastures, and gorging themselves to an extent which cuts short the thread of life, by the advancement of various diseases. Instead of wandering from the summit of one peak to another, in quest of a scanty subsistence, or, instead of being compelled to descend from the summits of the mountain in the morning, and ascend again in the evening, they are compelled, in many cases, to remain within a few yards of a particular spot for weeks together, and there engorge themselves to satiety.

But what, it may be asked, has this to do with the foot-rot?—More, I am inclined to think, than is generally imagined. The hoofs of sheep being intended to receive a degree of friction from hard surfaces, are not acted upon when the animal is placed under such circumstances; and the necessary consequence is an overgrowth of the hoof. The crust,—the part naturally intended to support the weight of the animal, and to endure the greatest share of fatigue,—is here allowed to grow out of all due bounds, because the softness of the pasturages, upon which it now moves, presents little, if any, of that rough friction to which the feet of the animal is naturally intended to be exposed. The crust, therefore, grows unrestrained, until it either laps over the sole, like the loose sole of an old shoe, and serves to retain and accumulate earth and filth, or is broken off in detached parts, in some cases exposing the quick, or opening new pores, into which particles of earth or sand force their way, until reaching the quick, an inflammation is set up, which, in its progress, alters or destroys the whole foot.

It is well known that there are some pastures peculiarly apt to produce this disease, and these vary to such an extent, that it is with an almost irresistible necessity that the conclusion

thence derived is, that the disease is highly infectious. Few have ventured to question this point; and the stubborn facts advanced in support of such doctrine are so strong, that it requires some degree of hardihood for any one to attempt to refute it. Before I therefore venture to give any opinion upon this part of the subject, I shall first advert a little further to the nature of the situations and circumstances under which the disease most commonly makes its appearance.

The finest and richest old pastures and lawns are particularly liable to this disease; soft, marshy, and luxuriant meadows are equally so; and it is also found in light, soft, or sandy districts. In the first of these it is perhaps most prevalent in a moist season, and in the latter in a dry one; in short, it exists to a greater or less extent in every situation which has a tendency to increase the growth of the hoofs without wearing them away, and more especially where they are kept soft by moisture. It is so prevalent in fine lawns and pleasure-grounds, that they are, in many instances, reduced in value to a mere trifle as a pasture for sheep; they are said to be *infected* with this disease, and having once become so, the vicissitudes of *seven* seasons are scarcely sufficient to destroy the contagion. A luxuriant herbage on soft pastures is equally subject to it; and, in both cases, the disease is increased in a wet season.

The reason why, in these situations, sheep are so liable to the disease, is quite obvious. They are generally brought from lands where their range of pasturage was greater than in these situations. In their former state, from the exercise which the animal took, and the nature of the grounds on which it pastured, the hoof was worn down as it grew. But, under the state in question, the hoofs not only continue to grow, but, where the land is moist, that growth is greatly increased; and the animal does not tread upon hard ground, nor has it exercise to wear them down. Now, in the case of man himself, when the nails of his fingers or toes exceed their proper length, they break, or give him such uneasiness as to induce him to pare them. And the same takes place with the hoof of sheep. But there is this difference in the case of the latter, that when their hoof once breaks, as the animal has not the power of paring it, the part thus broken must continue a wound. Some parts grow out of

their natural and proper proportions ; the crust of the hoof grows too long ; and the overgrown parts either break off in irregular rents and unnatural forms, or, by over-shooting the sole, allow small particles of sand or earth to enter into the pores of the hoof. These particles reach the quick and set up an inflammation, which is followed by the destructive effects which are too well known to require description.

Similar effects are produced on soft wet grounds. The feet, in such a situation, are not only not subject to a proper degree of friction to wear down the hoofs, but the growth of the hoofs is materially increased by the soft and moist state in which they are kept. And this state renders the feet the more liable to the disease, as it opens up the pores of the horn, and allows the earth or sand to penetrate, and wound the quick, in the manner I have already stated. On soft sandy ground, of a dry nature, the same circumstances may occur. The soft sand gives way by the weight of the animal, and the crust of the hoof is not worn down. The sand penetrates between the sole and the crust, as has been already explained, and produces inflammation. The disease, however, is not so common on sand as in the other situations to which I have alluded, the sand seldom being found in such a loose state.

There is another circumstance which tends to produce the disease in an overgrown hoof. The length to which the crust grows changes completely the proper bearing of the foot ; and this lengthened crust, by being extended forward, is subjected to the whole weight which the foot has to bear. By the continued strain of the parts on this lengthened toe, inflammation is set up in a manner similar to what occurs in acute founder in horses ; and this inflammation produces effects extremely analogous. This is also frequently the cause of disease in the feet of oxen or milch cows, which have been kept standing for a long period in the cow-house. The laminated structure by which the crust in the sheep's foot is connected, like that of the hoofs of horses, having been inflamed, and that inflammation kept up by the continuation of the causes which originally excited it, there is produced a change in the structure from which the hoof is formed ; and, there being a diseased secreting organ, of course a diseased secretion of horn is produced. We have

therefore a loose spongy horn secreted, which, from the openness of its pores, admits the particles of earth and moisture more freely than before, and these are also at the same time more securely lodged by the rapid growth and overshooting of the crust, until, by the continued irritations upon the quick, they soon cause a discharge of matter. This matter from the inflamed part, by mixing with the moisture of the ground and the particles of earth, increases more rapidly the destruction of the whole foot.

The progress of the disease is not equally rapid in every instance. Sometimes it seems to go on to a certain extent, and the foot may again, in a considerable degree, recover. All the feet of the same animal are not equally affected, the fore ones being most liable to the disease. Sometimes there is only one of the feet affected, but that is most commonly a fore one. At times I have found only one of the digits of the foot affected; and, in some, from the hoof having been broken short off, I have found one of the toes recovered, while the other toe continued diseased.

In the first stage of the disease there is only found a little overshooting of the edge of the crust, which seems either to be overgrown and bent in upon the sole, or the edge of the crust is forced asunder from the sole by a wedge of earth, which, by the pressure alone between the crust and the laminated structure, produces inflammation. With this the sheep becomes lame, and the disease spreads rapidly. In the other case, the crust or edge of the hoof continues to grow until it envelopes the sole and lodges matter, as has been already stated. The softening of the horn of the sole, from these causes, soon excites that inflammation which detaches the hoof, and produces the alterations in the secreting surface which constitute the disease. Nature, however, is bountiful in her provisions. The inflammation which is set up is not generally of the most active or acute kind; for it would appear that, instead of the inflammation being raised to that pitch which would at once throw off the hoof, there is for a time, most commonly rather an increase in the action of the secreting parts, and a large quantity of new horn formed. This horn, however, is of a soft nature, and unfit for the perfect functions of the part, but it, nevertheless,

presents a surface less sensitive than the more irritable surface which it covers.

The sound and healthy horn being destroyed, the *vis medicatrix* which exists in the secreting part throws out the most insensible substance which it is still able to produce, in order to afford a temporary protection to the parts underneath; and even when, by increased or long continued irritation, the parts are unable longer to secrete even this weak horn, granulations of proud flesh sprout out, whose surface is not of the most sensitive kind.

In all cases there is a general increase of the secretion of the whole hoof. In some parts, however, this is greater than in others, and hence the great increase of the crust, and the general distortion of the foot. As the disease is continued, this secretion is altered, according to the degree of the inflammation which exists; and the hoof, particularly the inside of it, between the digits, has a ridged-like appearance. At the connexion of the crust at the inside with the softer and thinner parts of the hoof towards the heel, there is also commonly a separation, or fissure, from which is thrown out a loose thread-like fungus, similar to what occurs in canker in the foot of the horse—to which disease, indeed, some have considered foot-rot very analogous. The difference between the analogy of the two, however, consists in this, that, in some cases of long standing, it approaches towards canker, while, in more recent cases, it resembles thrush. Foot-rot, however, is attended with more inconvenience to sheep, than thrush is to the horse.

We occasionally meet with something more closely analogous to it than either canker or thrush, in cases of weak heels with corns, or in what is called a seedy toe in the foot of the horse. In such a case we often find mild or indolent inflammations, followed by suppuration, which proceeds slowly detaching the crust as in foot-rot.

In other circumstances, however, we find, that instead of the slow and gradual progress of the disease which I have described, it moves on with greater rapidity; violent and painful inflammation is set up, which renders the animal excessively lame in a short time. It even breaks out at the coronet (top of the hoofs), causing the whole hoof to be detached; or the digits be-

come swelled at the coronet, matter is formed, and sinuses run in various directions. The upper part of the space between the hoofs becomes inflamed, irritated, and moist with a secretion of matter; or, by the play and inflammation being kept up, ulceration extends, and the toes are cleft up almost to the canal above them. This canal is inflamed, the mucous follicles with which it is lined are increased in their action, and pour out a large quantity of sebaceous-like matter, which spreads over the fore-part of the foot, and between the hoofs, and assists in accumulating the filth by its adhesive qualities. In other forms of the disease, it would appear that this interdigital space is the primary seat of the disease, in which cases it will be found that the hoofs are quite worn down by the kind of ground upon which the animal pastures; but while it is of that nature to wear down the hoofs, the space between the hoofs, and also the coronets, must be constantly exposed to the action of cold and moisture, until the derangement is set up in the circulation of those parts which produce the disease, in a similar manner as chilblains in the human subject.

The same effect is also sometimes produced in another manner on particular pastures. As the animal moves along, the strong coarse grasses are drawn through between the hoofs, until, by repeated friction, inflammation in the form of scalding is set up, which will be increased or diminished according as the cause is continued, or a proper treatment adopted.

In many cases maggots are found wallowing in the matter of foot-rot, which has led some to suppose that the disease is produced by some insect. This, however, is only an effect, but not a cause of the disease. We find maggots, at certain seasons of the year, in every situation where an accumulation of putrid animal matter is to be found. I have found them during summer in canker, thrush, and grease, where the cause was too apparent to be questioned; and this, I think, is also the case with maggots in foot-rot. In all cases much constitutional disturbance is produced; the animal loses flesh rapidly; the flesh is red from the degree of inflammatory fever produced, and unless relieved by proper treatment, the animal becomes worn out by irritation, and its inability to seek its food; for a while it shifts about upon its knees, but at last dies from irritation and want.

On examining the feet of a flock, in a short time after they have been placed in what is called an *infected* pasture, it will be found that many of them are becoming rapidly affected with foot-rot, and that, too, before any matter has made its appearance, and before any of the sheep have been found lame. In some situations, the disease is so rapid in its progress, that in two or three weeks the whole flock becomes affected ; and this, it is supposed, is produced by infection.

This case most commonly occurs when sheep have travelled a good distance, and are put upon a wet pasture. Their feet, having been too much worn down and heated on their journey, are then exposed to filth and moisture. By the injury which they have received upon the road, the pores in the horn, which are the consequence of such travelling, render them more liable to disease than if they had travelled a moderate distance. And if they happen to be lame from the effects of a long journey, the whole is charged against the infected ground, or to some Nestor of a sheep which has communicated the contagion.

One of my pupils, some time ago, happened to have some conversation with a shepherd, and was arguing with him against the infectious nature of the disease, but without being able to convince him of its non-infection. The shepherd gave him the following case as a proof of its highly infectious properties :— He once set out on a journey with a flock, and there happened to be one of them lame from foot-rot before starting, and ere he had travelled sixty miles, there was scarcely a sound one in the flock. Such a proof of infection as this was not easily overturned ; the road had been infected by the diseased sheep, and what between the road and the sheep, it is evident the disease spread. Such is a specimen of the infectious nature of it, or rather the views regarding it. In all probability these sheep had been going on wet soft pasture, and the hoofs being weakened, or perhaps diseased before setting out, lameness was a necessary consequence.

When I consider the stubborn facts which are urged in support of the infectious nature of this disease, and the weight of those opinions which may be brought in support of it, I conceive it to be a matter deserving of calm and dispassionate consideration. But, after the pains and investigation I have be-

stowed upon it, I feel compelled to advance a contrary opinion, and to state, that the idea of its being infectious is a mere delusion—an error which is fraught with most important consequences, inasmuch as it has directed the attention to erroneous causes, and thereby to improper or useless means for its prevention. Nay, even lands which have got the name of being infected have in consequence become unnecessarily diminished in value.

Since, then, it appears to me that the disease is not infectious, what, it may be asked, is the cause from which the foot-rot arises? I have already described the situations and circumstances under which the disease is found to exist, from which the answer follows as a consequence. I have stated, that wherever we find rich old pastures covered with moss plants, or where the hoofs, from the softness of the surface by the quantity of grass upon it, are prevented from being worn down, the disease will be found to prevail; and in those situations where the soil is rich and moist it will be found more particularly increased. For similar reasons it will prevail more especially where there is a superabundance of grass; and on dry old pasture it will be found to proceed most rapidly at the season when the dews are greatest. When it occurs on light sandy soils, the dry seasons will be most liable to produce it.

All this, it will perhaps be said, may be quite true, and still the disease has not been divested of its contagion. One will say he knows of ground, where foot-rot never existed before, becoming infected by a few sheep, perhaps a single one, having been brought upon it, and that the disease has spread in a few weeks to the whole flock. Another will say he knows of a case where all the ewes of a flock have caught the infection from a single ram. But, in such cases, has nothing been done in the way of improving these lands? The Ettrick Shepherd, in a paper in the last Number of this Journal, has shown that even the alterations produced by the destruction of moles has a material influence in causing it, and that, too, while he at the same time considers it infectious. But has any one ever attempted to produce the disease by inoculation? If it is highly infectious, surely it will at once be produced by inoculation. But this is not such an easy matter as one would expect from a disease which is sup-

posed to infect a whole field, and that, too, even if it be of 500 acres in extent.

Gohier, a French veterinarian, first applied a piece of horn from a diseased foot, covered with the matter, to the sole of a sound foot, without effect. Secondly, he rubbed a diseased foot against a sound one, without effect. Thirdly, he pared the sound foot, and having applied a piece of diseased hoof, the disease afterwards appeared; but, in this case, the foot afterwards got well of itself, and there seems to have been a doubt in the mind of Gohier as to whether it was truly foot-rot or not.

Other French veterinarians have tried similar experiments, and particularly Vielhan of Tulle, and Favre of Geneva; and although I have not seen an account of their experiments, it is said they succeeded in producing the disease by inoculation. Now, it will be asked, is not this a sufficient proof of its infectious nature? I answer that it is not. It appears to me that this is a strong proof against it. If it is produced with so much difficulty by the direct application of matter, is it not absurd to suppose that a few sheep with diseased feet should infect a whole field? I have not seen an account of the manner in which the experiments of the French veterinarians have been performed. I know not what quantity of matter was employed, neither have we any account of counter experiments, nor whether any were tried to prove whether a similar effect would not have been produced by the application of any other morbid matter;—for example, whether the matter of grease from the heels of horses, or from thrushes, would not have produced similar effects. I have little doubt of such being the case,—that suppuration might be produced by inoculating with that or almost any matter, if in the operation the wound was made sufficiently deep; nor would I doubt that disease would be produced if matter was spread over the foot in sufficient quantity, and applied for a sufficient time.

But I repeat, that it is absurd to suppose that, if applied to the hoof, it would produce the disease. The hoof is not governed by the laws of living matter; it is totally insensible, and it has not a circulation, neither has it nerves; it absorbs moisture only like a piece of inert matter, and it is not acted upon as a living part. Matter from the foot of a diseased sheep might as

well produce the disease in a tree, nay, even more likely, because it is a living body, which the hoof is not. Why, then, are we to suppose the hoof to be acted upon by matter from diseased feet, and that, too, after the matter has been exposed to the influence of the atmosphere? But rain and sun, we must suppose, have no influence upon it. Arsenic may be diluted with water to such an extent as to be swallowed with impunity, but water seems to increase the virulence of the matter of foot-rot. It is true, that heat and moisture will reduce, after sufficient exposure, animal matter to a putrid mass of the same consistence and properties; but the influence of these agents is lost upon the matter of foot-rot. The plague is now known not to be so infectious as it was once thought to be, but the foot-rot will still infect the most extensive domains. The upas-tree may annihilate the existence of all that comes within its pestiferous shade; but what is that to the infection of the foot-rot, when a single sheep will contaminate a mountain?—Nay, it will act even upon parts totally devoid of vitality; and such, too, is the eccentricity of its action, that it will allow its neighbouring toe to escape, and still infect the whole ground!

Was there ever any thing more absurd than the doctrine that this disease is infectious? What is the quantity of matter secreted, that it should thus operate; and in what mysterious form does it work? We find but a few drops, even in very bad cases, thrown off in many hours; yet it has been found that it does not act upon the hoof, unless the foot has been wounded. Does not common sense, then, declare that infection can have nothing to do in the case? But I need not discuss this point further at present, as I trust I have already shown that all ideas of its infectious nature are merely chimerical.

As this disease arises in consequence of the hoofs not being exposed to sufficient friction to wear them down, or keep them in their proper state, or where their natural growth is increased by the nature and moisture of the ground, the hoofs of all the flock should be regularly rasped or pared at short intervals, say from eight days to a fortnight, according to the rapidity with which a particular pasture produces the disease. In certain situations, they might be made to travel upon a hard surface similar to natural sheep tracks, or be folded in a place purposely pre-

pared, upon which they could move about and wear their hoofs. For that purpose, they should be placed in it every day.

Driving the sheep along a hard road for a short time daily, would have a similar effect ; laying their tracks with gravel would also be beneficial. And, as an experiment, I would suggest to those whose lands are apt to produce the disease, to satisfy themselves by feeding an equal number of diseased sheep and sound ones together in a fold with a hard dry bottom : let that bottom be kept free from filth and moisture, and I have no doubt it will be found, that, instead of the sound sheep becoming infected, the diseased ones will become sound, unless, indeed, the feet are so far destroyed as to require medical treatment ; but even in that case, the improvement will be more rapid than under other circumstances. By the means which I have stated, simple as they are, I have no doubt the foot-rot may be made to disappear from many of those places where it at present proves a great deterioration to the value of pastures.

In conclusion, I may further add,—as the locality must be familiar to every one who takes an interest in the romantic scenery around Modern Athens,—that, while the rich pastures which are in the neighbourhood of Arthur Seat are very subject to the disease, that hill itself is not only almost entirely free from it, but if the sheep when first infected are removed from the low grounds to the hill, they soon get well ; it therefore follows, that the disease may be prevented by adopting proper timely measures : and by adopting the principles I have endeavoured to establish, and applying them according to the circumstances of the infected pastures, a considerable stop may be put to the disease, and, in many situations, it may be altogether prevented.

I do not conceive it necessary, to enter upon the cure of the disease. Enough has been written on that subject, and many of the plans recommended are sufficient for the end. Suffice it to say, that the principal points to be attended to are paring away the detached hoof, and dressing the surface with some caustic, of which muriate of antimony is the best. But, as prevention is better than cure, I would recommend a strict investigation into the cases in each pasture, and having ascertained the true cause, the proper means of prevention will be readily suggested.

ON THE CULTIVATION OF THE AMERICAN POKE-WEED.

THE most superficial observer cannot, without feelings of wonder, contemplate the immense variety of systems of organization by which nature elicits from the inorganic elements those multiplied products which she renders subservient to the support of other more complicated systems. From apparently no other materials than air, water, and earth, or from the two former alone, is it not astonishing to see how many substances, so different from each other, and from every thing else, are daily elaborated, and let loose into the world, to be reconverted into other substances, or finally restored to their pristine state? And then how extensive may be the application of the products of even a single one of these systems! A plant, taken from its native wilds, cherished and disseminated by man, produces food for millions of that strange race, which has so modified the face of nature. The wheat, the maize, the rice, and other cerealia, are the great supporters of human existence; and such is the fertility of Nature, and the amplitude of the means which she has supplied, that, were these annihilated, there are doubtless others perfectly suited to supply their place: For, although the idea that the perfection of nature depends upon the maintenance of her integrity, may be a fine idea, still finer, and more correct, is that which represents the integrity of Nature such that, were a link of her chain lost, she has the power of restoring its continuity, without injury to the other links. But, in fact, Nature has no such chain. Her systems are reticulations; and, should one of them become wanting, the universe needs not of necessity fall into disorder. The dodo has become extinct; but who, save a few ornithologists, has ever felt the loss? From our own country, many animals have disappeared, and what the worse are we? But while gaps have been made in the constitution of our country, we have received accessions of strength. The potato itself, a native of another land, is worth more than all that we have lost, and furnishes an instance of the importance which

a humble, long unknown, and long despised individual, may assume in the economy of the world. The land which supplied it has many other gifts in store. Of these gifts, which from America could hardly be styled βασιλικα δῶρα, were we to consider the anti-basilikal prejudices of its inhabitants, one may here be brought prominently into notice. It is the *Phytolacca decandra*.

This plant belongs to the family of *Atriplicæ* of the natural system, and to *Decandria Decagynia* of that of Linnæus. The genus to which it is referred is characterized by a coloured, persistent calyx, with five divisions; the absence of corolla; from eight to twenty stamina, with awl-shaped filaments, and roundish anthers; a round depressed berry, having eight or ten longitudinal grooves, and as many cells, each containing a single kidney-shaped seed.

The *Phytolacæ* are shrubby or herbaceous plants, with undivided leaves, and small flowers, disposed in racemes, which are generally opposite to the leaves. Eight species are known, none of which are indigenous in Europe; although, in the southern parts of it, one of them has become perfectly naturalized, as the *Oenothera biennis*, from the same country, has in the west of England. This naturalized species is the one which, on account of its many useful properties, it is here proposed to recommend to notice.

Phytolacca decandra. Willd. Sp. Pl. vol. i. p. 822. Pursh. Fl. Amer. vol. i. p. 324. An excellent figure of it may be seen in Audubon's splendid Engravings of the Birds of America.

The root is perennial, very thick, fleshy, six or eight inches in diameter, and divided into several large branches, which run deep into the soil. Stems one or several, nearly woody, cylindrical, five or six feet high, of a purplish colour, and dividing, in their upper part, into many dichotomous branches. The leaves are short-stalked, alternate, or irregularly disposed, ovato-lanceolate, smooth, from four to six inches long, of a deep green, changing in autumn to purplish. The peduncles are from five to eight inches long, of a beautiful deep red colour, on which are arranged the short-pedicellate, pale-red or white flowers, forming pendulous racemes from five to eight inches

long. The berries are circular, depressed, of a bluish-black colour, with ten or twelve cells.

This plant is a native of North America, growing in open woods, old fields, and by-roads and fences, from New England to Carolina. It is there known by the names of *Poke-weed* and *Poke-berry*. It flowers in June and July. It was introduced into Europe upwards of 200 years ago, and was cultivated in England in 1640. Although it does not seem to have attracted much attention in this country, it has become naturalized in Spain, Portugal, some parts of Italy, and the south of France, where it has been used for various purposes.

In America, the juice of the root is used as a common purgative. An infusion of the dried root in wine is employed there as an emetic, operating gently but effectually. The juice of the berries is also purgative: the roots are applied to the hands and feet in fevers. Independently of its medicinal properties, it is a plant of considerable importance there, the young shoots being eaten as a delicious and wholesome salad, and the tender leaves being boiled and used as spinach. When older, however, they become acrid, and exhale a nauseous odour. The juice of the berries is frequently used as red ink. It tinges linen and other substances of a beautiful purplish-red colour, which, however, soon fades, as no means have hitherto been discovered of fixing it.

In Portugal, the purple juice of the berries was long used to give a finer colour to port-wine; but it was alleged to give it a disagreeable taste, and to deteriorate its quality; on which account, the government gave orders for the destruction of the stems before the berries should arrive at maturity. In Italy, the juice of the root has been applied to ulcers with good effect.

Poultry are fond of the berries; and, in some districts of the south of France, these fruits are advantageously employed for feeding them. When eaten in too large quantity, however, they are said to communicate a disagreeable flavour to their flesh.

The stems, when cut previous to the evolution of the flowers, yield a large quantity of potash on being burned. The great beauty of the long clusters of black berries, with their bright

red stalks, the large size of the leaves, and the general appearance of the plant, would render it a great ornament to our gardens. Although the countries in which it grows most abundantly and luxuriantly, are possessed of a much higher temperature than ours, it yet occurs naturally in other parts of the United States, where the mean temperature is as low as with us.

In Miller's Dictionary, the following directions are given for its cultivation :—" Sow the seeds in the spring, upon a bed of light earth ; and, when the plants come up, transplant them into the borders of the flower-garden, allowing them space to grow ; for they will overbear other plants, if they are too near them, especially if the soil be good. Clear them from weeds ; and, in the autumn, they will produce flowers and fruit. The first frosts will destroy the stems, but the roots will abide, and shoot in the spring."

ON THE TAMARACK, OR AMERICAN LARCH.

THIS beautiful tree—*Larix Pendula*—is not perhaps so generally known in this island as its importance entitles it to be. It differs from the European species in the smaller size of its leaves and cones, the latter of which are about half the size of those of the Common Larch. Its larger branches are nearly horizontal, and somewhat pendulous. It sheds its leaves at the fall, and renews them in spring ; and indeed in all its characters so nearly resembles the larch of Europe, that it is by some considered to be merely a variety. It grows in the higher latitudes of North America. It is abundant in Vermont, New Hampshire, and the districts of the Maine ; but it is beyond the St Lawrence, and in an especial manner near the Lakes St John and Mistassin, that it begins to form continuous masses of forest, miles in extent. It is found in Nova Scotia, and plentifully in Newfoundland ; and it extends far to the north towards Labrador. The limits of its appearance to the south, are the highest and most exposed mountains of Virginia ; but even in Pennsylvania and New Jersey it is rare ; and in the neighbourhood of New

York, it is seen only in the swamps of white cedar, with which it is scantily intermixed*.

Like other trees of the genus, it grows to a great size. It is remarkable for the elevation to which it attains, even in those boundless regions of magnificent forest where it is indigenous. Its trunk is smooth, straight, and slender, being two or three feet in diameter, but rising to the height of from eighty to a hundred feet in the places suited to its growth. Its wood, like that of the European species, is tough and durable. Its specific gravity is so great, that its weight is frequently regarded as an objection. It is used in ship-building for the knees of vessels, and for every purpose of carpentry to which the wood of pines is applied. By the French Canadians it is termed *Epinette Rouge*, and its wood is the most esteemed by them of all the resinous kinds. It is equally valued when it is obtained in the Eastern states of America, but there it is greatly less used, from its rarer occurrence amidst the more extended growth of the black and hemlock spruce, the red cedar, and other resinous trees of the American forest.

There is another species or variety of larch known in the American woods, called *Microcarpa*, which also has declining branches, but is distinguished from that which we have been describing by its smaller fruit. In the magnificent work on Pines of Sir A. B. Lambert, it is described as a separate species, while by others it is regarded, and probably more correctly, as a variety. Its wood, like that of the Tamarack, is tough, durable, and ponderous; it is used for the same purposes, and is held in the like estimation.

The Tamarack, growing in the high latitude and frozen regions of Hudson's Bay and Labrador, is calculated to withstand a far more intense cold than is ever known in these islands. It might even be inferred from this circumstance that it is a hardier tree than the larch of Europe, which, although it extends to the high lands of Russia and Siberia, is rather a native of the mountain regions of southern Europe—the Alps of Switzerland and the Tyrol. Little opportunity, however, has yet existed in this island of comparing the American with the European larch.

* Michaux on the Forest Trees of North America.

There are some examples of the former at Dunkeld, on the property of the Duke of Athol, where, however, the trees are said not to have reached the size of the larches of Europe; and we have recently heard of another experiment in Perthshire, where a plantation has been formed, consisting of the tamarack and common larch planted together. It is still too soon to draw inferences as to the relative merits of either from this latter experiment, but as yet the superiority of growth has been in favour of the American species.

Whatever, however, be their relative value for forest culture, it is certain that both species are wonderfully hardy, and calculated to resist the utmost rigour of temperature at which forest trees can be raised in Britain. They possess a wide range of climate in the Old World and the New,—growing in the most elevated regions of either, and nearly at the limits of vegetable life.

A general opinion prevails, that the hardiest tree for our mountains is the Scotch pine. We have heard this opinion controverted; and so far as our observation extends, the larch will grow in every situation where the Scotch pine can grow, and at a greater elevation. We conceive that it merits an important place in the forest culture of the mountains of this country, whether we regard its hardy qualities, the quickness of its growth, or the value of its timber. No tree, we conceive, will yield so quick a return to the planter, and none is more easy to be cultivated. It is frequently, indeed, planted in situations which are unsuitable to it, and hence the want of success which often attends its culture in certain situations, as in clays, and in marly and marshy soils. The larch of Europe is indigenous in dry, rocky, and elevated grounds. The larch of America is known to grow in flat and even swampy regions, and may perhaps be found to be capable of cultivation in places to which the European larch would be unsuited.

ESSAYS ON THE ORIGIN AND NATURAL HISTORY OF DOMESTIC ANIMALS. *By JAMES WILSON, Esq. F.R.S.E., M.W.S. &c.*

ESSAY V.

ON THE ORIGIN AND NATURAL HISTORY OF THE DOMESTIC HOG.

THE highly important, though not very extensive, order of Pachydermatous or thick-skinned quadrupeds contains, in accordance with the views of modern naturalists, the following genera, viz. the Tapir, the Rhinoceros, the Hyrax, or Cape Marmot, the Peccari, the Babyroussa, the Wild Boar, the African Boar, the Hippopotamus, and the Horse. The striking difference in character and appearance presented by these animals, when compared with each other, has induced their formation into families or lesser groups, which some writers, with good reason, regard as constituting so many distinct and well defined orders. The more our knowledge of the magnificent circle of Nature's works increases, the greater the necessity becomes of sacrificing many pre-established views, and adapting our superstructural arrangements to the more solid and extended basis deduced from the knowledge of anatomy, and the careful observance of natural instincts and modes of life.

With a repulsive aspect, an ungraceful form, the most sensual habits, and a disposition frequently approaching to the ferocity of the carnivorous tribes, the domestic hog is yet one of the most useful of quadrupeds. If the value of a benefit depends in a great measure on its universality, this animal may indeed claim a higher rank than many of a loftier nature; for we may say of it, as Horace has said of "*pallida mors*," that it ministers alike "in huts where poor men lie," and in the palaces of kings.

With the exception of New Holland, and the countries of the extreme north, we find animals of the hog kind, using the words, for the present, in their more extended signification, over a vast extent of the earth's surface*. Setting aside the subgenus

* The wild boar, according to Pennant, is common in all the reedy marshes of Tartary and Siberia, and in the mountainous forests about Lake

Phacochærus, which is distinguished by a difference in the number of the incisive teeth, the other animals of the hog kind probably amount to not more than five distinctly ascertained species. Of these, two species called Pecaries, are peculiar to South America, north of the tropic ; of the three others characteristic of the ancient continent, one (*Sus babyroussa*) is confined to the Indian Archipelago, another (*Sus larvatus*) occurs in Africa, and a third (*Sus aper*, or the Wild Boar,) the most important and most widely distributed of the whole, is found in numerous portions of Europe, Africa, Asia, and the Islands of the Indian seas.

The differences observable among our domestic breeds, though considerable, are by no means sufficient to establish, as some have supposed, the probability of their descent from a double or triple source. If we fix our attention upon the two extremes, and comparing a small Chinese pig of the improved breed, with a huge and shapeless mass, such as is still found in the well-provisioned sties of England, we may no doubt find some difficulty in assigning a reason for supposing both to have been derived from the same origin. But this is a defective mode of considering either the varieties of a species, or the species of a genus ; for where the intermediate links are wanting, we are unqualified to judge of the real relations of the two extremes ; and it is the ascertainment of these links, whether presented by the affinities of varieties, of species, or of genera, that constitutes the true and essential knowledge of nature.

Now, we know that a connecting link may be traced between all these varieties, however distant they may seem ;—we know that their instinctive habits, under similar circumstances, are always the same,—that their periods of gestation correspond,—that all the features of their anatomical structure are identical, and that they intermingle with each other, and produce a fertile young. These circumstances go far to prove their descent from a common stock ; and when we add, that all the domestic varieties with which the experiment has been hitherto tried, produce freely with the wild boar, we cease to doubt that that species is the stock in question. That the wild boar is a very

Baikal, as far as Lat. 50° ; but it is said not to occur in the north-eastern extremity of Siberia.—See *Arctic Zoology*. vol. ii. p. 40.

fierce and relentless animal, forms no obstacle in the way of such conclusion; for we know, on the one hand, that, when taken young, it may be trained up in a state of the greatest confidence and familiarity with the human race; and we also know, on the other, that even the domestic boar is, as Massinger says, "not to be trusted in a tripe shop," and that children, both dead and alive, have at various times and places, fallen a sacrifice to its omnivorous and irresistible appetite. There seems to be no sufficient reason, then, for seeking elsewhere than in the wild boar for the origin of our domestic breeds, and we shall therefore present a brief sketch of its history.

The wild boar is of a brownish-black colour over the entire body and limbs. Its bristles are very hard and stiff, especially along the spine. Its ears are very moveable, and its eyes exceedingly small. It is an animal of great strength, and considerable activity; but its dimensions, though large, do not equal those of an overgrown individual of the domestic breed. It continues to increase in size and strength for four or five seasons, and is said to live for thirty years.

Wherever the boar occurs in a state of nature, he is found in moist and shady situations, generally well wooded, and for the most part not far distant from streams and marshes. He prefers even cultivated grounds, with all the dangerous consequences likely to result from such localities, to dry or open tracts of weather-beaten barrenness. However fierce in self-defence, when attacked or irritated in some favourite place of strength, or during the rutting-season, when his passions are inflamed, his habits, unaltered by the depraving influence of a semi-domestication, may be said to be almost entirely herbivorous; that is, his tastes are confined to plants of various kinds, to the fruits which they bear, and the roots by which they are nourished. According to Buffon, however, wild boars have been seen to eat horse-flesh; and the skin of the deer, and the claws of birds, have been sometimes found in their stomachs. Desmarest adds, that they devour the smaller kinds of game, such as leverets and partridges, and whatever eggs they fall in with in the course of their route. This certainly looks suspicious; and it must be admitted that the tame breed is very fond of blood, since they often swallow their own young, and

have been known to crunch children in the cradle. Whatever is humid, unctuous, or filled with fatty particles, is licked, sucked, and swallowed. "It is common," says Buffon, "for a whole herd of these animals to assemble round a heap of new dug clay, and though it is very little unctuous, they will lick it all over, and some of them swallow great quantities." Humboldt's clay-eaters of South America have therefore an example in the "swinish multitude" of other countries.

The wild boar, if not a nocturnal animal, is, at least, frequently observed to quit its covert during the evening twilight. When it has its lair in the neighbourhood of cultivated fields, it commits great devastation, by turning up the soil in long straight, deep furrows, in search of roots or grain. Like the domestic breed, it grubs up its food by means of a strong, somewhat lengthened, flexible snout; and its delicate sense of touch and smell in that organ, enables it to discover and disinter with great quickness and nicety many favourite low growing plants, concealed beneath the prevailing pasture from all other herbivorous animals, or even sunk beneath the soil. Hence the necessity of its dwelling in moist and shady places.

The old boar is seldom found in company with either the female or her young. The mothers are said to unite in families for mutual protection, and when attacked, they surround their offspring, by placing them in the centre of the group. These assemblages disperse during the rutting-season, which takes place in winter, generally in the month of December or January. Each male now attaches himself to the society of a chosen female, an arrangement not seldom accompanied by the defeat or death of a weaker or less fortunate rival. They retire "beneath the shadow of some antre wild," or to an obscure and sheltered recess of the forest,

"Where low on earth the princely cedars lie,"

and, for about thirty days, the pair never leave each other's company. The female carries her young for about four months, and produces, according to her age, from four to ten pigs, which she immediately withdraws from the cognizance of the male, who, instead of educating the family, would eat them. They are at first striped with longitudinal brown bands, on a ground of white and fawn colour. The female parent proves herself a

most attentive mother. She suckles her young for three or four months, and retains them in her presence for a much longer time, to instruct and defend them. Her courage in the protection of her offspring is indomitable; and the latter repay her attentions by a constant and long-continued attachment. An aged female is sometimes seen followed by several families, among which there are individuals of two or three years old, and consequently almost in the adult state. These young rovers are called by the French hunters *bêtes de compagnie*. Sometimes several females, each with one or more families, herd together, and such assemblages are sufficiently formidable, whether viewed in connexion with the damage which they occasion to the fields in which they pasture, or with the danger which is likely to accrue to the rash or inexperienced huntsman*. The old boar exhibits considerable intelligence in avoiding his enemies, although the strong scent which emanates from him, especially in a state of irritation, renders his eventual escape from the hounds an event of rare occurrence. In his revenge, also, there is, except in his dying agonies, less of blind and indiscriminate fury than might be supposed. Even when harassed by a pack of hounds, and in imminent danger of being torn to pieces, when he receives a ball from the huntsman's rifle, he is sometimes known to turn upon his pursuers, to break through the bellowing pack, and to single out and assault with savage ire his human persecutor.

It is about the age of four years that the wild boar affords the most delightful as well as dangerous sport. At that period of his life, he runs for a long way, and finally makes the most vigorous and long-continued self-defence. His tusks are also at that time exceedingly sharp and long, and being less completely curved round than in more advanced age, he is able to disembowel a dog, to rip up the thigh of a man, or lay bare the flank of a horse, with ease and pleasure. These, and other accidents, combining fear and hope, render the chase more exciting than it might otherwise be found.

The French newspapers, towards the end of last century, contained an account of an extraordinary wild boar which was

* Se réunissant quelquefois en troupes de plusieurs centaines, et dévastant en un seule nuit des espaces considérables cultivés en vignes, en blé ou

killed in the neighbourhood of Cognac in Angoumois *. This animal had previously been several times seen and pursued by the hunters, but had always contrived to effect its escape, although it had received many desperate gunshot wounds, and had sacrificed the lives of numerous dogs, and of several men. When it was finally slain, not a few old bullets were found sticking between the skin and the flesh. Sonnini says that this animal was of enormous size (he does not state either its weight or dimensions), that it had a very long head, a very sharp and pointed snout, and a terrific mouth, armed with teeth and tusks of a very singular form. The hairs of its body were white; those of the head yellowish; the neck was marked with a black band in the form of a cravat, and the ears were large and straight. Notwithstanding its great size, it was an animal of uncommon swiftness †.

Let us now devote a few pages to the cultivated breeds. One of the most singular circumstances in the domestic history of this animal, is the immense extent of its distribution, more especially in far removed and insulated spots, inhabited by semi-barbarians, where the wild species is entirely unknown. For example the South Sea Islands, on their discovery by Europeans, were found to be well stocked with a small, black, short-legged hog; and the traditionary belief of the people in regard to the original introduction of these animals, showed that they were supposed to be as anciently descended as the people themselves. Yet the latter had no knowledge of the wild boar, or of any other wild animal of the hog kind, from which the domestic breed might have been supposed to be derived. The hog is in these islands the principal quadruped, and is more carefully cultivated than any other. The bread-fruit tree, either in the natural state, or formed into sour paste, is its favourite food, and it is also abundantly supplied with yams, eddoes,

en pommes de terre, sur les lisières des bois. Au mois de Décembre, le rut des sangliers commence; alors les mâles se battent entr' eux, et sont bien plus dangereux pour l'homme qu'en tout autre temps."—Desmarest's *Mammalogie*, p. 391.

* See the *Journal de Saintonge*, the *Journal de Bouillon*, seconde quinzaine d'Avril 1787, and others.

† See Shaw's *General Zoology*, vol. ii. p. 461.

and other vegetables. This choice of a nutritive and abundant diet, according to Forster, renders the flesh juicy and delicious, and the fat, though rich, is not less delicate and agreeable to the taste than the finest butter. Before the missionary labours which have proved so signally successful in those once forlorn and benighted regions, had substituted the mild spirit of Christianity for the sanguinary forms of a delusive worship, the Otahitians, and other South Sea islanders, were in the habit of presenting roasted pigs at their *morais*, as the most savoury and acceptable offering to their deities which they had it in their power to bestow. They covered the *sacred pig* with a piece of fine cloth, and left it to decay at its leisure near the hallowed spot.

Hogs are now abundant in America. They were not, however, indigenous in the new world, but were transported thither by the Spaniards, soon after the first discovery and conquest of the western regions by that nation. Indeed, the extensive benefit now derivable from the creature in question, may be said to proceed in a great measure from the facility with which it is conveyed from one quarter of the globe to another, combined with those omnivorous propensities which admit of its feeding and fattening in places apparently unadapted to its nature, and the quickness with which it conforms itself to a change of circumstance and situation. Next to man himself, it is one of the most perfect cosmopolites with which we are acquainted.

These are a few of its merits while alive; but its chiefest treasures, like the miser's gold, become available only after it is dead. Its flesh (much esteemed by every one who is neither Mahometan nor Jew *) takes in salt more kindly than that of any other animal whatever: it consequently keeps longer in that preserved and artificial state, and is the most valuable and highly prized as sea-provision of all the articles of naval store. Its lard is employed by the apothecary for plasters, and other medicinal uses, and by the perfumer in the making of pomatum. Brawn seems an article of domestic preparation peculiar to

* The love of pork on the part of the Chinese, has been assigned by a philosophical historian as a principal reason for the rejection by that nation of the laws and religion of Mahomet.

England *. The bristles are of great importance to brush-makers all over the world, and are also necessary to the shoe-maker's trade. Its skin is formed into pocket-books, and is employed in the manufactory of saddles, and numerous other articles; and the very ears are sometimes made into pies.

Linnæus was of opinion that the flesh of the hog was a wholesome and nutritious food for those accustomed to daily exercise; but he deemed it less advisable for such as lead a sedentary life. Notwithstanding the generally approved flavour and delicacy of pork, it cannot be denied that many individuals, by no means either whimsical or fastidious in other respects, regard it with an antipathy never manifested towards beef or mutton. Yet it is said that the labouring classes can subsist longer upon this diet, without the desire of change, than upon any other kind of flesh whatever. Sonnini says, that in Egypt, Syria, and even the southern parts of Greece, the flesh of this animal, though white and delicate, is never firm, and is generally so overcharged with fat that it scarcely suits even the strongest stomach. Its proscription by the priests and legislators of ancient days was therefore not entirely arbitrary, but rather founded on a judicious policy, derived from a knowledge of its unwholesome nature, or at least of its comparative unfitness for a sultry climate. An indulgence in pork was probably inconsistent with health beneath the burning sun of Egypt or Arabia. "The Egyptians were permitted to eat pork only once a year, on the feast day of the moon, and then they sacrificed a number of these animals to that planet. At other times, if any one even touched a hog, he was obliged immediately to plunge into the Nile with

* The management of boars with a view to brawn, and the after preparation of the article, as practised in Kent, and some other parts of England, are little known. The immediate interests of those concerned, induce them to keep the process secret. According to answers returned to queries transmitted by the Board of Agriculture in 1804, the boars are put up for feeding at all ages, and in an entire state; but they are preferred when only two years old. They are usually kept apart, each in a case so small as scarcely to admit of its turning round. Sometimes several are put together in larger pens. Their accustomed food is beans, with sulphur in their water. A large animal, producing a collar of about 30 lb weight is preferred. At the time above alluded to, it brought 2s. a pound. The lean parts being made into sausage-meat, are sold at 6d. a pound.—See the *Farmer's Magazine*, vol. vi. p. 431.

his clothes on, by way of purification. The swine herds formed an isolated class, the outcasts of society. They were interdicted from entering temples, or intermarrying with any other families. This aversion for swine has been transmitted to the modern Egyptians. The Copts rear no pigs, no more than the followers of Mahomet. The Jews, who borrowed from the Egyptians * their horror of pigs, as well as many other peculiarities, continue their abstinence from them in colder climates, where they form one of the most useful articles of subsistence †. Heligabalus was said to have abstained from hog's flesh because he was a Phenician.

During the gluttonous days of the Roman Empire, one of the most famous of their Epicurean dishes was called *Trojanus*. This consisted of an entire hog stuffed (as was the Trojan horse with armed men) full of larks, thrushes, capons, beccaficoes, and other delicate birds, steeped in exquisite gravy made of the choicest wine and other costly materials. The expense of this dish was so enormous that it became the subject of a sumptuary law; and Cincius, in his oration, reproves the excess of banqueting, in *opponendi mensis porcum Trojanum*. Another favourite dish of those "architects of gluttony," was formed of a hog presented entire, whereof one half was roasted and the other half boiled; and the whole was so curiously prepared by the cook (*mira etiam coqui industria ita paratus*) that it was impossible to discover how the creature had been slain, nor yet how its interior came to be stuffed (*variis deliciis*) with sundry delicate things.

The hog is by no means devoid of natural intelligence. The German huntsmen, in approaching the wild boar, endeavour to

* Although the Jewish Legislator, through whom the divine laws were promulgated, was versed in the customs of the Egyptians, the abhorrence of the Israelites for the flesh of swine resulted from a direct prohibitory command. "And the swine though he divide the hoof, and be cloven-footed, yet he cheweth not the cud; he is unclean unto you. Of their flesh shall ye not eat, and their carcass shall ye not touch; they are unclean unto you."—*Levit.* ch. xi. ver. 7, 8. "And the swine because it divideth the hoof, yet cheweth not the cud, it is unclean unto you; ye shall not eat of their flesh nor touch their dead carcass."—*Deut.* ch. xiii. ver. 8. See also *Isaiah*, ch. lxxv. ver. 4; and ch. lxxvi. ver. 3.

† Griffith's *Animal Kingdom*, vol. iii. p. 418.

keep to leeward, lest he should scent their approach, and be too easily alarmed: his sense of sight, if not obtuse, is rather limited in its range; but his hearing is accurate and extensive. The domestic species, being usually confined within a narrow space, where the only sense in exercise is that of taste, yields with great readiness to the undue indulgence of that sensual propensity, and his other faculties become proportionally blunted from disuse. When, however, he is intentionally trained to the exercise of a more extended capacity, he acquires numerous accomplishments inconsistent with his usual habits, and, according to circumstances (omnipotent over man and beast), becomes either like the "Learned Pig," an adept in alphabetical lore, or, like the "Sporting Pig," a perfect Nimrod in the more active amusements of the field.

Toomer, the gamekeeper of Sir H. P. St John Mildmay, broke in a black sow to find game, back, and stand to her point, nearly as steadily as a well bred dog. This sow, according to Mr Bingley, was a thin long-legged animal (one of the ugliest of the new forest breed), and, when very young, manifested a great partiality to some pointer puppies, then under the care of the keeper at Broomy Lodge. It often played and fed with them; and it occurred one day to Toomer that, as he had broken many an obstinate dog, he might also succeed in breaking a pig. The little animal willingly cantered along with him to a considerable distance from home, and he enticed her still farther by means of a kind of pudding, made of barley-meal, which he carried in one of his pockets. His other pocket was filled with stones to throw at the pig whenever she misbehaved, as she was too frolicsome to allow herself to be caught and corrected, like the dogs. She proved, however, upon the whole, to be tolerably tractable, and he soon taught her what he wished by this system of rewards and punishments. She quartered her ground as regularly as any pointer, stood stock still when she came upon game, and backed *other* dogs with great steadiness. "When she came on the cold scent of game, she slackened her trot, and gradually dropped her ears and tail till she was certain, and then fell down on her knees. So staunch was she, that she would frequently remain five minutes and upwards on her point. As soon as the game rose, she always returned to

Toomer, grunting very loudly for her reward of pudding, if it was not immediately given to her. When Toomer died, his widow sent the pig to Sir Henry Mildmay, who kept it for three years, but never used it, except for the purpose of occasionally amusing his friends. In doing this, a fowl was put into a cabbage-net, and hidden amongst the fern in some part of the park; and the extraordinary animal never failed to point it in the manner above described. Sir Henry was at length obliged to part with this sow, from a circumstance as singular as the other occurrences of her life. A great number of lambs had been lost, nearly as soon as they were dropped, and a person being sent to watch the flock, the animal was detected in the very act of devouring a lamb. This carnivorous propensity was ascribed to her having been accustomed to feed with the other dogs, and to eat the flesh on which they were fed. Sir Henry sent her back to Mrs Toomer, who sold her to Mr Sykes of Brookwood, in the New Forest, where she died the usual death of a pig, and was converted into bacon *."

It is related by the Labat, that the Sieur Brûe, having attempted in vain to soften the ferocious disposition of a tiger which he had bred at Fort St Louis, on the western coast of Africa, became anxious to know how a hog would succeed in defending himself against so large and powerful a beast. With this view, he caused one of these animals to be disconnected from a drove, and the rest to be conveyed to some distance. No sooner was the tiger loosed than the hog retired to an angle in the wall of the fort, where, for a length of time, he kept the tiger at bay. At last, however, he was so closely pressed as apparently to lose his presence of mind; and, in his terror, he set up a tremendous scream. This immediately brought the whole drove to his assistance, when they fell at once on the tiger with such impetuous and irresistible fury, that, to save himself from being torn to atoms, he was obliged to make an instantaneous escape by springing into the ditch of the fort †.

The length to which the preceding introductory and miscellaneous observations have already extended, will render it ne-

* Bingley's *British Quadrupeds*, p. 453.

† *Voyage Occidentale*, tom. ii. p. 27.

cessary, with a view to our doing more ample justice to the more practically important part of the subject, that we should defer the consideration of the cultivated breeds till next Number. We shall there present the economical history of all the principal British and Continental races of the Domestic Hog.

ON DETERMINING THE WEIGHT OF FAT CATTLE BY MEASUREMENT.

1. The Farmer's Assistant, or Ready Reckoner, and Land, Hay, and Cattle Measurer. By JAMES M'DERMONT, Teacher of Mathematics, Navigation and Landsurveying, Ayr. 1830.
2. Cary's Cattle Gauge. London.

THE ascertaining the weight of fat animals by the eye, is to the inexperienced a matter of much uncertainty. The butcher, indeed, from his daily practice, is soon able to form a just estimate of the weight of animals. For his first essays, which must often be made at random, are subjected to the test, by having the animal killed and weighed; and thus, from time to time, he is enabled to modify his views, and correct his more imperfect estimates. He, too, knows the price per stone, and the value of the different parts, which he can obtain from his customers, by which he is enabled to calculate the price that he can afford to give to the seller. But the seller,—should he happen to be a breeder or a grazier, with whom the stock has been fattened,—unless his experience has been long and extensive, may often experience a difficulty in ascertaining its actual selling price. He has no doubt data, too, upon which to form a kind of approximation to its value. He knows the cost of its original purchase; he knows, too, the period he has kept it, and the quantity and value of the produce which it may have consumed; and from these data he is enabled to calculate the fair remuneration which he ought to receive for his trouble, expense, and outlay of capital. This would do very well for the seller, and would, in general, be a tolerably satisfactory principle upon which to proceed. But this principle of calculation is liable to many objections. The extent of improvement which the stock

may have made,—the state of the markets at the time, and other modifying circumstances,—influence this calculation in a material degree. The respective estimates, therefore, of the seller and the butcher,—the former calculated upon the cost of production, the latter derived from the price obtainable from the consumer,—will seldom be found to accord. The inconveniences and loss arising from a difference of opinion between the buyer and seller, are by the latter often severely felt. He may frequently be deprived of his market, and compelled to keep on his stock at much expense and inconvenience, or afterwards to sell it at an inferior price. It is therefore of much importance that both parties,—the inexperienced, as well as the most perfect and matured judges,—be able to ascertain the real value of their stock.

The proportion which the live weight bears to the dead weight of the four quarters, has been a subject of investigation, and is employed as one of the methods for ascertaining the actual weight, and consequently the value of fat animals. In a paper by Mr Fergusson of Woodhill, in a preceding Number of this Journal, the subject has been treated of. It has there been shown, that by taking the live weight, and deducting therefrom the one-half, the result gives too small a weight. But, by the medium result obtained from the tables there given, it appears that the live weight, multiplied by .605, or the $\frac{605}{1000}$ th part of the live weight, will give the dead weight of the four quarters. And the coincidence of the result obtained from sheep and cattle respectively as there shown, by establishing the principle, adds an importance and a value to this method of determining the dead weight of animals. But this mode of ascertaining the weight of the four quarters of an animal has its inconveniences in practice. The animal must first be weighed on a steel-yard, or by some similar method. And, besides the trouble attending it, especially with wild animals, the apparatus necessary for this purpose may not be found on many farms from which stock is to be sold.

A method of ascertaining the weight of animals by measurement has long been known. This is certainly simpler and more convenient than the mode above referred to, as the instruments for taking the dimensions of an animal,—a measuring-

line or a foot-rule, and a piece of cord,—will be found in the possession of every farmer and grazier. After the dimensions of the animal are taken, the weight is found in tables calculated for the purpose. But we shall here explain the calculation itself, and the principle upon which it is founded, by which any one may find the weight without the assistance of tables.

The Table published about the year 1804, on this subject, by John Ainslie, is perhaps best known. A table was also published by Alexander Stewart in 1826; and we have just seen a table by Mr M'Derment, recently published. Besides these, we shall have occasion to advert to an instrument for calculating the weight of animals, termed Cary's Cattle Gauge.

The manner in which the dimensions of the animal are taken, is the same by all whose tables we have seen. It is as follows: The animal being standing in a natural position, the girth or circumference is taken immediately behind the fore-legs, and the length is taken from the foremost upper corner of the blade-bone of the shoulder in a straight line to the hindmost point of the rump. These dimensions bring the figure of the animal into the form of a cylinder. The form of some cattle, indeed, is such as to cause the girth to have an elliptical form, but this departure from the circle is trifling, and need not be taken into account in the calculation.

The rule for finding the contents of a cylinder, is to find the area of the end, and to multiply that sum by the length. The common method is, to multiply the square of the diameter by $\cdot 7854$ (the area of a circle whose diameter is unity), and this product by the length, for the solid content. But, in the case of measuring cattle, the girth or circumference, and not the diameter, is obtained; and as the rule for finding the diameter correctly from the circumference, involves itself into long decimal multipliers, the process, especially when feet and odd inches are the dimensions, is complicated and tedious. The more simple method, therefore, is to multiply the square of the circumference by $\cdot 0795775$ *; and that product multiplied by the

* This number is obtained in the following manner. The area of a circle is equal to the square of the circumference divided by 4 times $3\cdot 1416$ (the circumference of a circle, whose diameter is unity); or 1 divided by $12\cdot 5664$ ($= 4 \times 3\cdot 1416$) $= \cdot 0795775$. Hence the square of the circumference multiplied by $\cdot 0795775$ gives the area of a circle.

length will give the content in cubic feet, or in whatever other measure the dimensions were used. And this multiplied by the established weight which a cubic foot or other measure is known to be, will give the weight of the animal.

The method of finding the proportional weight which a given measurement—for example, a cubic foot—contains, and by which the data for drawing out tables are derived, is this:—Find, by the rule given above, the number of cubic feet which the animal contains, and weigh the four quarters after it is killed; and the former divided by the latter would give the rate of weight per cubic foot. Thus, if an ox measures 8 feet in girth or circumference, and 6 feet in length, the calculation will be:— $8 \times 8 = 64 \times .0795775 = 5.09296 \times 6 = 30.55776$ cubic feet in the animal*; and suppose that the four quarters of the same animal, when killed, were found to weigh 91 stones $6\frac{1}{2}$ lb., of 16 oz. to the lb., and 14 lb. to the stone, this weight, divided by the number of cubic feet in the animal, will give the weight of a cubic foot. Hence, 91 stones $6\frac{1}{2}$ lb., equal to 91.4642857, divided by 30.55776, give 2.993 stones, or 2 stones $13\frac{9}{16}$ lb. per cubic foot. And this is the actual weight assumed for a cubic foot.

In the same manner, any series of measurements and actual weights may be added together respectively, and from these a general mean rate per cubic foot obtained.

The method given above, however, for calculating the weight, may be much shortened. As .0795775 and 2.993 are both constant multipliers in the operation, these numbers may be multiplied together, and the product used as one multiplier;—thus, $.0795775 \times 2.993 = .2381754675$. But only .238 may be taken as the multiplier, without incurring an error exceeding half a pound in the medium size of cattle. The example already given, then, according to this method of calculation, will be as follows: $8 \times 8 = 64 \times 6 = 384 \times .238 = 91.392$, or 91 stones

* As feet and odd inches are most frequently the dimensions given, the calculation may either be performed by duodecimals, or by reducing the odd inches to decimals or fractions; or both length and girth may be reduced to inches, and then proceeded with according to the above rule; and to bring it into feet, the product must be divided by 1728, (or 3 times by 12), being the number of cubic inches in a foot.

5½ lb *. Thus, then, to find the weight of a fat animal, multiply the square of the girth by the length, and that product by .238, or take the $\frac{238}{1000}$ part of it, or use any lower and more convenient denomination of the same value. This will give the weight in stones of 14 lb., and the decimal remainder (if any) multiplied by 14 will give the odd lb.

By this method Ainslie's Table is calculated through all its lengths and girths, with this difference only, that it is calculated at a weight of 17½ oz. to the lb., and 16 lb. to the stone. But in the following table, in which is given a comparison of their different weights under a given measurement, Ainslie's Table is converted to the weight of 16 oz. to the lb., and 14 lb. to the stone. As the former of these weights is one-fourth more than the weight given in the above calculations, Ainslie used the number .1905, or .1904 (for it is difficult to discover which, the difference produced by the two being very trifling), in place of .238, as the common multiplier. Thus, by the proportion which one weight bears to another, a multiplier can be obtained to suit any particular weight.

Mr M'Derment's method of calculating the contents and weight of fat cattle, which professes to have been derived from a series of measurements of cattle which were afterwards killed and weighed, is upon the same principle as that which we have already given. And, as will be seen in the table, Ainslie's and his weights very nearly agree. Mr M'Derment's rule is to multiply the square of the girth by five times the length, and divide the product by 21, which will give the weight of the four quarters; or he might have said, multiply the square of the girth by the length, and take the $\frac{2}{7}$ part of the product for the weight. Now $\frac{2}{7}$ converted into decimals is .28571428, which exactly agrees, in as far as the decimal numbers necessary for the calculation are required, with the numbers we have given.

Cary's Cattle gauge is an instrument made in the form and on the principle of a slider-rule. It is made of box-wood or ivory, 8 inches in length, and about 1½ inch in breadth. It is divided in the breadth into three parts, the two outer ones of

* In place of .238, the number .24 is used by some, but it is found to give too high a weight. In the example in question it would give 92 stones 2½ lb.

which are bound by a piece of brass at the ends, to keep them together, and the part between them is the slider. On one of these parts are marked lengths in feet and inches, from 3 to 6 feet; on the other part the weight in stones is given from 20 to 90 stones: and between these two parts is the slider, on the part of which next the weight are given the girths in feet and inches from 4 to 8 feet; and on the part of it which goes next the measures of length, are two points, set at certain distances from each other, one marked 14 lb. and the other 8 lb., for giving the weight either in stones of 8 lb. or of 14 lb. On the reverse side of the instrument is a continuation of the same parts, extending from 5 to 10 feet in lengths, from 6 to 11 feet in girths on the slider, and from 80 to 352 stones in weight. By placing the slider with the mark,—for example 14 lb.—opposite the given length on the part of lengths, and by looking opposite the given girth on the slider, will be found the weight on the part of weights in stones of 14 lb. Thus, with a length of 5 feet, and a girth of 6 feet 4 inches, by placing the mark 14 lb. opposite 5 feet on the part of lengths, and looking opposite 6 feet 4 inches on the line of girths, will be found the weight of 48 stones.

From the coincidence of the results obtained by this gauge, and from Ainslie's table, as afterwards given, it will be seen that they are both made upon the same principle. From the smallness of Cary's Gauge, the weights are only indicated in stones; and, therefore, the divisions of a stone, in the following table, are only assumed as nearest what it indicated. The only material difference between Ainslie's Table and Cary's Gauge will be seen to be at the girth of 5 feet 3 inches under its different lengths. But this discrepancy seems to arise from an error in Mr Ainslie's calculation, through this subdivision of his table.

Stewart's table does not coincide with those we have mentioned. The relation in which Ainslie's stands to it, as will be seen in the following table, is as follows:—At all the dimensions below 4 feet 9 inches in girth, the two tables nearly agree, but Stewart's generally gives the least. From 4 feet 9 inches to 5 feet in girth, under all the lengths, Mr Stewart's table gives rather more than Ainslie's. From 5 feet 3 inches to 5 feet 9 inches, with the smaller lengths, there is little difference; but with the

TABLE Continued.

Girth.		Length.		Ainslie's Table.		M'Dermont's Table.		Cary's Gauge.		Stewart's Table.		Girth.		Length.		Ainslie's Table.		M'Dermont's Table.		Cary's Gauge.		Stewart's Table.	
ft.	in.	ft.	in.	st.	lb.	st.	lb.	st.	lb.	st.	lb.	ft.	in.	ft.	in.	st.	lb.	st.	lb.	st.	lb.	st.	lb.
6	6	5	0	50	4	50	4	50 $\frac{1}{2}$	57	57	...	7	6	5	6	73	11	73	9	74 $\frac{1}{2}$	80	74 $\frac{1}{2}$	80
		5	3	52	13	52	11	53	61 $\frac{1}{2}$	61 $\frac{1}{2}$	...			5	9	77	0	77	0	77 $\frac{1}{2}$	83	77 $\frac{1}{2}$	83
		5	6	55	5	55	4	55 $\frac{1}{2}$	63 $\frac{1}{2}$	63 $\frac{1}{2}$	...			6	0	80	6	80	5	80 $\frac{1}{2}$	85 $\frac{1}{2}$	80 $\frac{1}{2}$	85 $\frac{1}{2}$
		5	9	57	13	57	11	58	...	...	...			6	3	83	11	83	9	84 $\frac{1}{2}$	88 $\frac{1}{2}$	84 $\frac{1}{2}$	88 $\frac{1}{2}$
		6	0	60	6	60	4	60 $\frac{1}{2}$	...	...	...			6	6	87	0	87	0	87 $\frac{1}{2}$	91 $\frac{1}{2}$	87 $\frac{1}{2}$	91 $\frac{1}{2}$
		6	3	63	0	...	...	...	...	...	...			6	9	90	7	90	5	91 $\frac{1}{2}$	94	91 $\frac{1}{2}$	94
6	9	4	6	48	13	48	11	49	55 $\frac{1}{2}$	55 $\frac{1}{2}$	...	7	9	5	0	71	8	71	7	72	79	72	79
		4	9	51	8	51	7	51 $\frac{1}{2}$	57 $\frac{1}{2}$	57 $\frac{1}{2}$	...			5	3	75	1	75	1	75 $\frac{1}{2}$	81 $\frac{1}{2}$	75 $\frac{1}{2}$	81 $\frac{1}{2}$
		5	0	54	3	54	3	54 $\frac{1}{2}$	60	60	...			5	6	78	11	78	9	79 $\frac{1}{2}$	84	79 $\frac{1}{2}$	84
		5	3	57	1	56	13	57	65	65	...			5	9	82	3	82	3	82 $\frac{1}{2}$	87 $\frac{1}{2}$	82 $\frac{1}{2}$	87 $\frac{1}{2}$
		5	6	59	11	59	9	60	69 $\frac{1}{2}$	69 $\frac{1}{2}$	...			6	0	85	12	85	11	86 $\frac{1}{2}$	91 $\frac{1}{2}$	86 $\frac{1}{2}$	91 $\frac{1}{2}$
		5	9	62	7	62	5	62 $\frac{1}{2}$	...	...	...			6	3	89	6	89	5	90 $\frac{1}{2}$	93 $\frac{1}{2}$	90 $\frac{1}{2}$	93 $\frac{1}{2}$
		6	0	65	1	65	1	65 $\frac{1}{2}$	...	...	...			6	6	92	15	92	13	93 $\frac{1}{2}$	96 $\frac{1}{2}$	93 $\frac{1}{2}$	96 $\frac{1}{2}$
		6	3	67	10	67	11	...	...	...	...			6	9	96	8	96	7	97 $\frac{1}{2}$	99 $\frac{1}{2}$	97 $\frac{1}{2}$	99 $\frac{1}{2}$
7	0	4	9	55	6	55	6	55 $\frac{1}{2}$	60	60	...			7	0	100	1	100	0	101 $\frac{1}{2}$	102	101 $\frac{1}{2}$	102
		5	0	58	6	58	4	58 $\frac{1}{2}$	63	63	...	8	0	5	3	80	0	80	0	80 $\frac{1}{2}$	85	80 $\frac{1}{2}$	85
		5	3	61	4	61	3	61 $\frac{1}{2}$	68 $\frac{1}{2}$	68 $\frac{1}{2}$	...			5	6	83	13	83	11	84 $\frac{1}{2}$	88	84 $\frac{1}{2}$	88
		5	6	64	2	64	2	64 $\frac{1}{2}$	73 $\frac{1}{2}$	73 $\frac{1}{2}$	...			5	9	87	9	87	8	88 $\frac{1}{2}$	91 $\frac{1}{2}$	88 $\frac{1}{2}$	91 $\frac{1}{2}$
		5	9	67	2	67	1	67 $\frac{1}{2}$	76 $\frac{1}{2}$	76 $\frac{1}{2}$	...			6	0	91	6	91	6	92	94 $\frac{1}{2}$	92	94 $\frac{1}{2}$
		6	0	70	0	69	13	70 $\frac{1}{2}$	77 $\frac{1}{2}$	77 $\frac{1}{2}$	...			6	3	95	4	95	3	96	98 $\frac{1}{2}$	96	98 $\frac{1}{2}$
		6	3	72	14	72	12	...	...	...	...			6	6	99	0	99	0	99 $\frac{1}{2}$	101 $\frac{1}{2}$	99 $\frac{1}{2}$	101 $\frac{1}{2}$
		6	6	75	12	75	11	...	...	...	...			6	9	102	13	102	12	104	104 $\frac{1}{2}$	104	104 $\frac{1}{2}$
		4	9	59	7	59	6	59 $\frac{1}{2}$	65 $\frac{1}{2}$	65 $\frac{1}{2}$	...			7	0	106	10	106	9	107 $\frac{1}{2}$	108	107 $\frac{1}{2}$	108
7	3	5	0	62	9	62	8	62 $\frac{1}{2}$	69	69	...	8	3	5	6	89	2	89	1	90	91	90	91
		5	3	65	11	65	9	66	72 $\frac{1}{2}$	72 $\frac{1}{2}$	...			5	9	93	3	93	2	93 $\frac{1}{2}$	94	93 $\frac{1}{2}$	94
		5	6	68	13	68	11	69 $\frac{1}{2}$	76 $\frac{1}{2}$	76 $\frac{1}{2}$	...			6	0	97	4	97	3	98	97	98	97
		5	9	71	15	71	13	72 $\frac{1}{2}$	79 $\frac{1}{2}$	79 $\frac{1}{2}$	...			6	3	101	4	101	3	102 $\frac{1}{2}$	101	102 $\frac{1}{2}$	101
		6	0	75	1	75	1	75 $\frac{1}{2}$	82	82	...			6	6	105	5	105	4	106 $\frac{1}{2}$	106	106 $\frac{1}{2}$	106
		6	3	78	3	78	3	...	83 $\frac{1}{2}$	83 $\frac{1}{2}$	...			6	9	109	6	109	5	110 $\frac{1}{2}$	110 $\frac{1}{2}$	110 $\frac{1}{2}$	110 $\frac{1}{2}$
		6	6	81	5	81	4	...	...	...	...			7	0	113	7	113	6	114 $\frac{1}{2}$	113	114 $\frac{1}{2}$	113
7	6	5	0	66	15	66	13	67 $\frac{1}{2}$	74	74	...			7	3	117	8	117	6	118 $\frac{1}{2}$	...	118 $\frac{1}{2}$	...
		5	3	70	5	70	4	70 $\frac{1}{2}$	77	77	...												

Of these modes of determining the weight of fat cattle, the preference is to be given to the method of calculation we have illustrated,—that is, to Ainslie's and M'Dermont's tables, including Cary's Gauge, over that of Stewart. Assuming the animal to present the form of a cylinder, and to be calculated as such, it affords a fair mode of obtaining the contents of its relative bulk, granting the cavity of the interior of the animal to be relatively as its other proportions, and for which we have no better fixed data. Some breeds of cattle, indeed, build more

flesh upon their legs than others; but even this circumstance is taken into account, in the increased girth of the animal behind the fore-legs, which such a form of the body generally occasions. The different lengths under the same girth, too, afford the same correct principle of finding the actual contents. That those anomalies to these principles of calculation, then, as given in Stewart's table, should be correct, is not at all apparent. Thus, in the extremes of the case,—very small animals, and very large ones,—the method of calculation already stated gives too much; while, of the intermediate sizes, the same method of calculation gives greatly too little, differing greater as the dimensions, and especially the length, increase; and, with the greater sizes, though both are less, the lesser ones differ more from it than the greater ones. This is a modification upon the method of calculation, in which we can trace no analogical or mathematical alliance, there being neither an increasing nor a decreasing ratio. But, we do not rest our reasons for differing from Stewart's tables, merely upon analogical or mathematical inferences. Besides the tables of the individuals above referred to, we have other facts to support our views. Cattle of various sizes, which were measured when in life, and afterwards killed and weighed, were found to give no such results as Stewart's table indicates; but, on the contrary, their weight accorded within a very few pounds with that obtained from the rule we have given.

Such is the mode of determining the weight of animals of the ordinary state of fatness, but there are certain circumstances to be taken into account in particular states of the animal. Mr M'Derment proposes the following modifications, which seem deserving of attention*. In the case of very fat animals, $\frac{1}{8}$ th or $\frac{1}{10}$ th part should be added to the weight obtained by measurement and calculation; and, when below the ordinary state of fatness, the same proportion should be deducted. A bull, from having more flesh upon the neck, should have $\frac{1}{4}$ th or $\frac{1}{5}$ th part added; and, in the case of old milch-cows, which

* Mr M'Derment's little book is a useful one of the class to which it belongs. Besides the measurement of cattle, it treats of various subjects of a georgical character, which must render it interesting, and of much practical utility to the agriculturist.

have had a number of calves, $\frac{1}{4}$ th or $\frac{1}{10}$ th part of the weight should be deducted.

When the seller has ascertained, by the rule we have given, the weight of any animal which he intends to dispose of, he must also take into account the other items, as tallow, hide, and other offal. These, particularly the tallow, differ materially in the different sizes, breeds and ages of animals, all of which he ought to keep in view when he makes up the estimate. By calculating the market price per stone of the four quarters thus ascertained, and adding to it the value of the other parts, he will have the total value of the animal; and, by deducting therefrom the butcher's allowance, the seller will know the exact price which he ought to receive. Opinions differ much as to the proportion which the butcher ought to receive for his trouble. By some it is held that the seller ought to receive the value of the four quarters, and the butcher the tallow, hide, and other offal. By others it is held that the seller is entitled to the value of the four quarters and the tallow, the butcher receiving the hide and other offal. Some butchers, however, allow the seller the value of the four quarters at the current market price, and add besides from 1s. 6d. to 2s. per stone on the weight of the four quarters as the value of that part of the offal which also belongs to the seller. This latter is a principle of calculation sufficiently favourable to the seller.

The same method of calculation is held to afford an approximation to the weight of sheep and swine. When the sheep, however, carries much wool upon it, it is necessary to tighten the measuring-cord, so as to take the girth of the animal without reference to the wool.

ON BEET-ROOT SUGAR.

To the Editor of the Quarterly Journal of Agriculture.

IN a former Number of this Journal, you endeavoured to direct the attention of the public to a fact not sufficiently known or appreciated in this country,—that the manufacture of beet-root sugar is extending itself rapidly on the Continent,—that a very large proportion of the sugar consumed in France is now the produce of the French soil,—that the making of beet-root sugar is now considered a necessary appendage to the business of an extensive farm,—that the experience of every year is adding to the extent of this manufacture, or branch of agricultural employment, and to the cheapness of its productions; and that it bids fair to add a profitable occupation to agricultural labour and capital in Europe, and to abolish slave-labour in the production of sugar, by supplying the European consumers with a home-made sugar at the same price. You laid before the public the estimates of practical men engaged in this manufacture in various districts of France, in which the local circumstances affecting the cost of production, such as the rent of land, price of labour, proximity of markets for other agricultural produce, were not very different from those which would affect the manufacture of beet-root sugar in this country. This was done, doubtless, in the hope that some farmer, or some proprietor, would take the subject to heart,—would set out from the plain and undeniable fact, proved by public documents, that the farmers of France do furnish a very large proportion of the sugar consumed by the thirty millions of the inhabitants of France, and would make himself master practically of this new and interesting branch of farming business. The hope might even have been cherished, that, as the test of experiment is not very terrifying, some private agriculturist would fairly try whether it would or would not pay the British farmer, to make beet-root sugar. By *fairly trying it*, I do not mean that one should begin with a considerable expense for utensils, and beet-root, and labourage, and attempt to make beet-root sugar profitably by following instructions for the manufacture derived either from treatises on the subject, or even from his own personal in-

spection, if that does not amount to experience and personal practice of the various processes. Such a trial would, I can tell beforehand, be a failure. If Professor Hope would try his hand at brewing a boll of malt, or Sir John Sinclair at making a cheese, the man of science and the agriculturist would, we have no doubt, be put to shame before the practical skill of the housekeeper and dairy-maid. A *fair trial* would be, to lay down a crop of thirty or forty acres of white beet-root, giving it the fair cultivation of a green crop under fair and regular husbandry and to go in summer to the neighbourhood of Arras (where people from Russia, Poland, Prussia, Austria, and from every district of France, go to acquire a knowledge of the manufacture of beet-root sugar, as regularly as people with us go to East Lothian or Berwickshire, to see the processes of good farming), and there engage a regular beet-root sugar grieve from the farm of Monsieur Crespel, or any other known manufacturer of beet-root sugar, and give him utensils, labourers, and beet-root, under a strict attention to economy, and a liberal consideration of the quantity of labour which may be ultimately saved, but which on the first erection of a manufacture must be expended in the necessary operations. This would be a fair trial.

These endeavours, however, to stimulate the agricultural public to examine more closely this interesting subject, have, I fear, been without success. The commercial world, aware that already the production of home-made sugar begins to be felt in the continental markets, was much more alive to the importance of the anonymous communication. The gentlemen of the Glasgow periodical press, afraid that the growers of beet-root would not "Let Glasgow flourish," hastened to assure their fellow-citizens, that it was some secret enemy to our West Indian establishments, who had insinuated the possibility of home-made sugar competing with slave-made sugar in the European markets;—that the idea was absurd, and the estimates and calculations of the cost and value of beet-root sugar stated in the communication altogether erroneous.

If the question, whether home-made sugar can or cannot enter into competition with slave-made sugar in the markets of Europe, depended upon the correctness of the ideas, or the cor-

rectness of these estimates and calculations, I would defend them if right, and amend them if wrong; and the gentlemen of the Glasgow press would not have remained without an answer; but it depends upon principles vastly more weighty than the opinions and sentiments of individuals. The principles upon which the solution of this most important question depends are these: Is it or is it not correct, that the manufacturers of beet-root sugar in France supply a large proportion of the sugar consumed by thirty millions of people inhabiting France? Is it, or is it not correct, that upwards of 100 beet-root sugar-works in France, threw last year 4460 tons weight of sugar into the consumption of that country, according to the official returns? Is it, or is it not correct, that the only protection these manufacturers of home-made sugar receive, or require from their government, is an impost-duty upon colonial sugar, which is not higher than the impost-duty upon sugar in this country? and which was not imposed with a view to encourage home-made sugar more than colonial sugar, but upon the same plain principle as our own impost-duty, viz. that every sort of property which receives the protection of a government, ought to contribute towards the expense of supporting that government? Is it or is not correct, that the price of sugar in France to the consumer is the same, as nearly as possible, as the price of sugar in England, or in any part of the Continent, distance of carriage, or municipal dues making the only difference? If these questions can only be answered in one way, the main question is already solved; and home-made sugar clearly can and does enter into competition, in the European markets, with slave-made sugar. If government, indeed, either in France or in England, were to grant a bounty, or protecting duty, or an undue encouragement of any kind, to the grower, either of home-made sugar or of slave-made sugar, there can be no question of that sugar scale into which government had thrown its sword and shield, making, for the time at least, the other scale to kick the beam. If that be the point which the gentlemen of the Glasgow press laboured to establish, it must be conceded at once. Home-made sugar could not stand against slave-made sugar, if the growers of home-made sugar, in addition to the taxes on their property for the support and defence of the go-

vernment and establishments under which they enjoy it, had also to pay what their neighbours, the growers of slave-made sugar, ought to contribute from their property for the same purpose ; or, in other words, if our West India proprietors are to be governed and protected at the expense of the other classes of the community, and if their productions are not even to contribute an impost-duty to the common expense, but are to be free of every tax. But if every kind of property which receives the protection and benefit of government, is made to contribute, as in justice it ought to do, to the expense of that government ; if every kind of property is fairly taxed, and not with any view of specially favouring one branch of industry, or one class of producers, more than another, and not upon the erroneous idea, that one sort of labour is of more value to the State, or more entitled to its protection, than another ; then the manufacture of home-made sugar would undoubtedly enter into competition with slave-made sugar. The proof is, that, in France, with an impost-duty on sugar not exceeding what our government levies on this species of property, as its proper quota towards the general expense, the production of home-made sugar increases rapidly.

“ Let Glasgow flourish ! ” I shall not press upon the consideration of the gentlemen who are the organs of public feeling in this most religious, moral, and commercial city, that if every human being, black or white, possessed his own—that which his Creator bestowed upon him—his own liberty, his own labour, to be disposed of by himself at fair wages, slave made sugar could not stand against the competition of home-made sugar ; but if government assigns the labour of one class of its subjects to another class of its subjects, for nothing, in order to carry on some particular branch of manufacture, there can be no doubt that those who have their labourers for nothing but the cost of feeding them, may send coals to Newcastle, or potatoes to Ireland ; or, what in a few years will be as proverbially ridiculous, sugar to Europe.

The manufacture of beet-root sugar in France has advanced so far, that it presents itself with all the intricacy and imposing development of old establishments, carried on with considerable capital and expensive machinery. It is no longer a collection

of pots and pans, and tubs and vats, in the corner of an old barn, that constitutes a beet-root sugar-work in France. The processes of rasping and pressing are performed in many cases by steam-engines and hydraulic presses, and the boiling, concentrating, evaporating, and crystallizing processes are very generally carried on by the agency of steam. These are improvements which the economy of labour, time, and fuel, suggests; and the experience and success of sixteen years encourage and sanction. If any of your agricultural readers should wish to see what practical farmers in France think a fair establishment, upon a large farm, for this branch of their business, I would recommend to him to lay out 30s. on a ride upon the top of the coach from London to Dover, and 10s. 6d. on a passage to Calais. Let him inquire at Calais his way to a village called Coulonne. It is on the side of the canal, about four miles from Calais. He will there see a sugar-work, upon a considerable farm, fitted up in the most approved manner. It is no wonder, no show-place in the country, there being at least five such establishments within a circle of thirty miles; so that he may inquire of half the people of Calais, without finding one who ever heard of it. He will find it by following the canal. At this farm he will see a beautiful steam-engine working the rasping machine, and two hydraulic presses and a well connected system of boilers, and condensing and evaporating vessels, all heated by steam. He will see, too, what will give him matter for deep reflection,—and what it would gladden the heart of Mr Joseph Hume to see,—he will see that, on the bank of a navigable canal leading from a coal country, the whole machinery for carrying on a manufacture which is totally unknown in Great Britain, is made, every bit of it, in England, in Spitalfields, London, by Messrs Spiller and Co.

It is not, however, in such large and complicated establishments which are approaching to perfection, that we can understand the nature and object of the various processes of a manufacture. From an old woman at her spinning-wheel, and a solitary weaver at his loom, we can derive a more just idea of the objects to be attained in the spinning and weaving the raw material, than we can do by viewing at once the wonderful and complicated machinery and arrangements of a large cotton ma-

manufactory. I will therefore endeavour to give an idea of the process of making beet-root sugar, from such information as I could collect, from those who are only beginning themselves to feel their way in this branch of agricultural business, and who are working on a small scale, and in the simplest, though not therefore the least expensive, way.

Beet-root is in much more general cultivation on the Continent, as a cattle-crop, than turnips. Turnips, indeed, are seldom seen, except as a second crop, sown upon an early stubble, and yielding a small and uncertain produce. The plant itself affords a more substantial food for cattle than turnips; and, when cultivated with care, appears to give as great a bulk of food from a given space of ground, as an ordinary turnip crop, and much more than a broad-cast turnip crop. The preference given to the cultivation of beet-root may arise, however, from the general state of husbandry, as much as from the particular nature of the plant. The country being, in general, open and unenclosed, cattle are of necessity stall-fed, day and night, and all the year round. Grass, that is natural pasture, does not, it may be said, exist at all; and, in fact, between the cold in winter, the heat in summer, the unenclosed state of the land under crop, and want of shelter, as well as of enclosure, when could cattle pasture? How many hours in the twelve months could sheep or cattle have the benefit of pasture, if pasture was there for them? Stall-feeding may be the best husbandry; but it is there one of necessity as much as of choice: and, of necessity, every piece of land must be brought under the plough, or left in a profitless state. The beet-root is better adapted for this state of husbandry than the turnip. It admits of being taken up in October, and pitted or stored for winter use, like potatoes. It is, bulk for bulk, a more substantial food than the turnip; and in spring, it is food when the turnip has ceased to be so. There are many varieties of the beet-root cultivated for cattle crops. There is beet-root entirely red, and entirely yellow, and entirely white; and white with red streaks, white with red skin, white with yellow skin, &c. Of these varieties, the entirely white is preferred for sugar-making, not as containing a greater proportion of the saccharine matter than the other varieties, but as yielding a juice more free from colouring matter. Roots of a medium, or rather small size, not

exceeding two pounds' weight, and which creak under the knife, and present a hard and almost shining fracture when broken, are considered the most productive in sugar. The cultivation is so entirely the same as that given to a turnip crop, that it is unnecessary to dwell upon it.

A slice of beet-root consists of a vast number of cells or vessels containing juice, which can only be obtained by strong pressure, and by deranging the fibres of the fleshy matter, so that the pressure can act on the greatest possible number of vessels. Boiling might extract the juice effectually, but it would mix with it so much vegetable matter, that there would be great difficulty in clarifying the juice afterwards. Crushing, or pounding, might reduce the roots to the state for yielding the greatest quantity of juice to pressure; but rasping or shaving the root to the thinnest possible state, is found the most convenient and effectual preparation for the press. It is, of course, understood that the roots are cleaned of all the dirt, tops, tails, roots of the leaves, and loose fibres being carefully removed by the knife; and that they are well washed by the hand or in a drum as potatoes are washed, before they are brought to the rasping machine. Eight women can easily clean five tons' weight in a day. From the cleaning place, the roots are brought to the rasp. The rasping machine is an iron cylinder of about 10 or 12 inches long, and of 30 inches in diameter. It has about a hundred and twenty toothed saws, or blades, upon its circumference, which, like fluted rollers, strike the beet-root and shave it down. The roots are pressed by the hand against the saws upon the exterior of the cylinder, there being a case to contain them, so as to prevent injury to the hand in feeding; and two roots at a time, the cylinder being of a length to suit two ordinary sized roots, are rasped almost to the state of down, with great rapidity. The rasp cylinder is covered with a case of sheet tin to prevent the raspings from being scattered about; it makes about 350 revolutions in a minute, and may rasp from 15 to 20 cwt. of roots in an hour. It may be driven by a two-horse power, by a belt from a horse-wheel of a thrashing-mill; but in many French sugar-works, it is driven by steam, where a greater power is required.

The raspings fall into a box under the rasping cylinder, and

are instantly shovelled into strong canvass sacks. The sacks, not quite full, and the mouth overlapping the side so as to prevent the loss of the matter contained in them, are laid under the press, and between each sack, in order to distribute the pressure equally, a willow bundle of wattled-work, such as are used in some counties for sheep hurdles, is laid, and the pressure applied. The more powerful the press the better. Bramah's hydraulic press is used in the larger French works, and is recommended strongly. Any ordinary double screw-press may do on a small scale; but four sacks, each with fifty or sixty pound weight of raspings, are as much as such a press can work upon with advantage; and it will require two of them to keep up with a rasping machine which is rasping 15 or 20 cwt. in an hour. It may here, once for all, be observed, that the cleaning, rasping, pressing, purifying, and other processes, must all follow each other without delay, and work to each other, because fermentation takes place rapidly in the pulp and juice. It is for the same reason that the greatest cleanliness is required in every branch of the manufacture. There must be a double set of sacks and hurdles, that a clean set may be in use for each day's work. The presses, rasp, and vessels, must be washed daily, and kept as clean and sweet as the utensils of a well ordered dairy. In these operations of cleaning, rasping, and pressing out the juice of the beet-root, all that is required is handiness, cleanliness, and a press of sufficient power. The most powerful presses, it is evident, will extract the greatest quantity of juice, and consequently give the most profitable return from a given quantity of beet-root. In the next operation, that of purifying the juice, skill, experience, and some chemical knowledge are required.

The juice, as it runs from the press, is of a milky colour, which soon becomes darker, is of the specific gravity of 8° to 11° of Beamo's areometer, and contains mucilage, albumen, vegetable fibre, and ammonia, and other chemically combined matters. The means of effectually purifying the juice of every thing prejudicial to the saccharine matter, that is, either mechanically or chemically combined with it, have been an object of research to the ablest chemists of France. The means now generally approved of and adopted are lime and sulphuric acid.

The use of lime is borrowed from the practice of the West Indian sugar-makers, who also purify the juice of the sugar-cane with lime; but how it operates is not well determined. It combines with some of the acids contained in the juice, and forms an insoluble precipitate, disengaging the ammonia, which flies off in gas, and leaving some alkaline properties still in the liquor. The quantity of lime to be used is not easily determined. It is in this that practical skill and experience are required; and there is considerable diversity of opinion as to the best mode of proceeding. Lime alone, without the aid of sulphuric acid, is found sufficient, when the juice is good and the work has gone on regularly; that is to say, when the quantity of beet-root has been rasped and pressed, and the juice to be purified has not stood above an hour and a half before it has been put into the kettle. The lime is first mixed with water, and when it is in the state of lime-milk, it is added, by degrees, to the juice in the kettle, to which the fire is applied during the time it is being filled with the juice from each pressing. As the lime-milk is added to it, the juice is well stirred, and it is brought to the boiling point as soon as possible. When the juice is heated, it will be seen, by taking up a glassful, if the specks or motes in the juice begin to settle to the bottom, and leave a clear yellowish liquor above them. If this is not the case, some more of the lime-milk, as much perhaps as one-fourth of the quantity first applied, must be added, and the fire kept up until the juice is on the point of boiling. The fire is then quickly withdrawn, for it is not advisable to allow the juice actually to boil, as the movement thereby given to the liquid scatters the impurities too much through it, and is unfavourable to their settling. After it has stood half an hour, the greater part of the substances separated, forms a scum upon the surface of the liquid; the other part has settled to the bottom, and the purified juice is between them. The scum is carefully removed, and the clear liquor drawn off by a cock. The scum and sediment are strained through a linen cloth, and pressed, in order to lose none of the juice.

When lime alone is used for the purification of the juice of the beet-root, the liquor thus obtained is more or less alka-

lime. The free alkali, when heated in solution with sugar, prevents the sugar from crystallizing; and the sirup containing the alkali has a most unpleasant flavour. To remedy these evils, it is found advisable to neutralize the alkaline properties of the juice, before boiling it into a sirup, by adding to it sulphuric acid. When this is found necessary, the mode of proceeding is exactly the same as that above described in the cases in which lime only is used, only that a little more lime is added. When the purified liquor is drawn off, as much diluted sulphuric acid is added to it as will nearly saturate the alkaline principles contained in the liquor. This is, of course, ascertained by trials with the usual tests for ascertaining the presence of an alkali or of an acid. It is better to have an excess of alkali than an excess of acid; and it is necessary to observe, that the ammonia, which may give an alkaline character to the liquor, escapes as gas on the application of heat in the process of evaporating the juice, and the liquor may be more acid than expected.

By another process which is approved of, the diluted sulphuric acid is added to the juice as it comes from the press, in the proportion of about $2\frac{1}{4}$ lb. weight of diluted acid to 100 lb. of juice, and after standing for twenty-four hours, by which time the upper half of the liquor is clear, but the lower half very muddy, it is poured into a kettle, of which the bottom is covered with a layer of pounded chalk, in the proportion of about 1 lb. of chalk for every 12 lb. of the liquor, and the whole is well stirred and brought to the boiling point without being allowed to boil much, and is left to settle as before described.

The next process is that of boiling in, or concentrating, the purified juice. The kettle for the first operation of purifying the juice, is in no respect different from a common washing kettle; but for evaporating the juice, it is necessary to have a number of smaller kettles working from this large one, because it is found that long-continued boiling heat, which is necessary for evaporating a great quantity of liquid in one vessel, is not so favourable to the crystallizing of sugar as a more rapid evaporation. The juice from the purifying kettle is tried with test papers to ascertain if it be alkaline or acid, and, in the first case, diluted sulphuric acid is very carefully added, until the alkaline nature

of the juice very nearly, but not entirely, disappears; and in the latter case, lime-milk, or powdered chalk, is added, until the acid is entirely saturated. The juice, which will still be warm from the purifying process, soon boils in the evaporating kettles under which a brisk fire is kept up. When the boiling sirup has attained the consistency which is indicated by 20° to 24° of the areometer, some powdered animal charcoal, in the proportion of about 4 lb. to the 50 gallons, is gradually mixed with it, and well stirred with a wooden spatula to prevent the charcoal settling to the bottom. The boiling is continued briskly, until the sirup attains the specific gravity indicated by 29° or 30° of the areometer. It is then removed from the evaporating kettle to go through the next process of clarifying. Before leaving the process of evaporation, it may be observed, that in the large manufactories the evaporating vessels are heated by steam; and the size, number, and arrangement of these vessels are so disposed with regard to the purifying vessel, and so disposed with regard to the vessels receiving the juice from the presses, that they all work to each other with as little loss of time or waste of labour as possible. The rasp, presses, and receiving vessels, frequently occupy an upper floor, or stage, and by pipes and cocks, are connected with the boilers on a lower level, so that all pumping, baling, and carrying about of the liquid, is saved. These are matters of economical arrangement highly important, because, like every other farming operation, the making of sugar to advantage must depend upon economy, but which turn upon local circumstances, and the experience and ingenuity of the manufacturer. All we can pretend to do, is to give an idea of the different operations in the making of beet-root sugar.

The object to be attained by clarifying the sirup, is to get rid of all the foreign matter which have separated from it in the boiling, and of those which the chalk, the acid, and the animal charcoal, have mixed up with it. These substances would no doubt in part settle to the bottom in time; but a great part would still remain suspended in the fluid; and they are so minute, that they would either pass with the liquid through any flannel, or other filtre, or would stop the pores of the filtre, so that the liquid could not pass. It is necessary therefore to mix

with the sirup some substances which run at a boiling heat, and diffuse themselves through the sirup, and, on cooling, are concentrated, and deposited with the other floating substances which they carry down with them. The white of eggs, bullocks' blood, and milk, are the substances generally employed by sugar-makers, and sugar-refiners, for clarifying their sirups. Within these twenty years the application of animal charcoal has been introduced in the sugar-refiners' trade, and its extraordinary power of abstracting colour and smell from vegetable matter in a fluid state, is becoming daily more known and used in the arts. Vegetable charcoal possesses the same property, but in an inferior degree. All animal matter may be used to produce charcoal; but the bones of animals are in general used for the purpose. As the ivory-black of the shops, however, is frequently adulterated, and as a cast-iron cylinder built into a furnace, and a few pieces of iron-pipe, are all the apparatus required for preparing it, the sugar-maker very generally makes his own charcoal. The beet-root sugar-maker has adopted the use of it from the sugar-refiner; and in this, as in other parts of the process, experience must direct him in the quantity to be used. When the sirup has been well mixed, and stirred, while boiling, with the animal charcoal, it is allowed to cool a little, before adding the clarifying substances. In this state the sirup will be of a dark grey or blackish colour, from the charcoal suspended in it; and if a little of it is poured out, between the eye and the light, the particles of charcoal will be seen floating in a clear liquid. The white of eggs is too costly to be generally used; and blood or skimmed milk, in the proportion of one part of the former, or two parts of the latter, to one hundred parts of sirup, is generally substituted. The clarifying material (if blood is used, it is generally mixed with an equal quantity of water), is carefully and intimately incorporated with the sirup, which is then brought to boil. After the sirup has briskly boiled up several times, a black stiff scum forms on its surface, which is easily removed; and on taking up a spoonful of the liquor, as a proof, black particles of the charcoal will be found in it, but which quickly subside, and leave above them a clear sirup. The clarifying is then finished, and the sirup can be removed from the kettle, the scum having been taken carefully off, and put

into vessels to settle for twelve hours, and deposite the sediment; for which purpose vessels of a conical shape are convenient. The operation of clarifying, however, does not always go on so successfully. Instead of a thick stiff scum, sometimes only a skin is formed on the surface of the sirup, which mixes with it when the skimming spoon is applied to take it off. This is caused by the sirup being too alkaline. The alkali prevents the diffusion of the albumen of the blood through the sirup, and consequently prevents its clarifying. By applying the test paper, this excess of alkali is discovered, and is remedied by the careful addition of some diluted sulphuric acid, with a new dose of blood or milk, and a renewed boiling. It only remains now to crystallize the sugar. A sirup of the specific gravity of 34 degrees by the areometer, contains still too much water for the sugar to crystallize, and it is necessary therefore to get rid of this water, either by allowing it to evaporate slowly of itself from the sirup, which is poured into flat dishes for this purpose, or to evaporate it by another boiling, or by steam applied to the vessels. By the first method, the pure sirup is put into flat dishes, and the temperature of the place in which they are set, is kept up for a few days, when a crystalline skin forms upon the surface of the sirup. This crystalline skin or crust is broken every two or three days, and mixed with the rest of the sirup, because if left upon its surface, it would prevent the evaporation of the water from what remains. After about three weeks the whole will be crystallized; and if the syrup was good none of it will remain, except what may be drained off by inclining the dishes containing it. If the sirup was not good, it may take much longer time before the crystals form themselves. If the sirup had been badly purified, or if too much of the sulphuric acid remained in it, the crystals formed are so small, that they remain suspended in the sirup, and form a thick mud, from which the sirup does not drain away. There remains, under the most favourable circumstances, a quantity of sirup intimately mixed with the crystals, which is to be got rid of by putting the sugar into stout canvass sacks, and pressing it for 48 hours in a powerful press. When no more sirup can be pressed out of it, if a raw sugar of the best colour is required,

it is passed between fluted rollers, and again subjected to the press; and this may even be repeated; and at last the sugar is spread out upon a clean tinned floor to dry. The sirup obtained is again boiled with charcoal and milk, or blood, and gives an inferior sugar. The other method of evaporating the sirup by boiling is much more expeditious, and is the same process as is followed with the juice of the sugar-cane in the colonies. Skill and experience are required in this process, to avoid burning the sirup, or giving it that peculiar and unpleasant flavour which is called burnt; and experience is required to know when the sirup is concentrated by the boiling to the most favourable point for being poured out and left to crystallize.

It is unnecessary to give in detail directions for doing that which is evidently an operation of practical skill and experience. I have before observed, that no explanations or directions could conduct, or even make intelligible, the ordinary operation of brewing ale, or making cheese, which every clever country girl is notwithstanding practically able to execute. I only aim, in this sketch, to give an idea of the processes to be done in making beet-root sugar, viz. rasping and pressing out the juice, purifying with lime and sulphuric acid, clarifying with animal charcoal, and blood or milk, evaporating and crystallizing the sirup. I do not advise any man, unless by way of amusement, to attempt these processes without personal skill, or the guidance of some person who has been operative for a season in a sugar-work. I would, on the contrary, dissuade any person from attempting to make beet-root sugar without such skill or guidance, because the failure, which could only be attributed fairly to his ignorance or inexperience, would unjustly be attributed to the manufacture itself. But earnestly would I desire to see some gentleman of property lay down thirty or forty acres of beet-root in spring, and in September send to France, to any of the sugar manufacturers at Arras, where it is considered to be well understood, for a foreman, and give him the means of working up this quantity of beet-root.

How many families in these kingdoms would be well contented to use even an inferior sugar at a higher price, if that

sugar was unpolluted with the tears and blood of slaves ; if it was produced from our own soil, by the free labour of our own farmers and farm-servants ? How many good and pious people in these kingdoms are contributing yearly to emancipate the heathen from ignorance and slavery ? One-tenth part of these yearly contributions would suffice to introduce a manufacture into Great Britain, which would abolish the evil of slavery in the Christian world. This is no matter of mere speculation. In the course of fifteen years the manufacture of beet-root sugar has advanced to such importance, that a large proportion of all the sugar consumed by thirty millions of people in France, is home-made sugar, not slave-made sugar. This is a fact never to be lost sight of. No arguments can get the better of it. The cane-sugar itself made no such rapid progress in the first fifteen years after the West India colonies received the sugar-cane. In fifteen years more, we have no doubt that one-half of all the sugar consumed on the Continent of Europe will be home-made sugar. It is asserted by many, who have not looked narrowly into the subject, that the manufacture of beet-root sugar exists only by extraordinary protection from Government, afforded in the shape of a heavy import-duty on West India sugar. This is not the case. West India sugar pays, and justly pays, an import-duty in France, as it does in England ; for why should this species of property not contribute, as all other property does, towards the general expense of government ? Why should the proprietor in England, or in France, pay for the West India proprietor his quota towards the revenue of the state ? On just principles, an import-duty is levied on this species of property. It is not a duty made heavier for the sake of favouring beet-root sugar. The retail price of sugar is not dearer in France than it is in England ; and beet-root sugar advances rapidly, with no other protective duty than what is levied as a just quota from that kind of property. If there was any good policy in protective duties, a protective duty in favour of a home-made article, become almost a necessary of life, and against an article raised by means contrary to every humane and religious feeling, would be good policy ; but no protection is required. Time, and a very short time, will make the Continent of Europe independent of colonial sugar.

Russia, Austria and Bavaria are advancing rapidly in the number of establishments for sugar-making. This country may be the last to attempt the manufacture ; but when it is begun, we shall not be surprised to see home-made sugar sold at a price far above its relative value, as compared to West India sugar ; there being a very great proportion of the consumers of sugar in Great Britain, who would gladly pay for the moral as well as for the saccharine quality of such sugar, if they could find it to purchase.

NOTE ON THE COMMERCIAL SYSTEM OF FRANCE, AS AFFECTING
THE MANUFACTURE OF BEET-ROOT SUGAR.

WE can assure our esteemed correspondent, that since his first interesting communication on Beet-Sugar appeared in our Journal, we have not been inattentive to the subject of this new production of the arts. We have procured from France various documents regarding the state and prospects of the manufacture * : and true it is, that in France a great part of all the sugar con-

* *Enquête sur les Sucres.* Commission formée avec l'approbation du Roi, sous le Présidence du Ministre du Commerce et des Manufactures, pour l'examen de certaines Questions de Législation Commerciale. *Impri-merie Royale, Mai 1829.*

Mémoire sur la Culture de la Betterave à Sucre ; par M. Pajot Descharmes. Paris 1815.

Sucre de Betterave. Opinion de M. Crespel Delliisse. A Messieurs les Membres de la Commission d'Enquêtes près le Ministère du Commerce. Arras 1828.

Observations présentées par des Fabricans de Sucre de Betteraves à son Excellence Monseigneur le Comte de Saint Cricq, Ministre Secrétaire d'Etat du Commerce, et des Manufactures, et Président de la Commission d'Enquête Commerciale. Dunkerque 1828.

Art de fabriquer le Sucre de Betterave, par M. Du Brunfaut. Paris 1825.

Traité complet sur le Sucre Européen de Betteraves. Traduction abrégée de M. Achard, par M. D. Angar ; précède d'une Introduction par M. Ch. Derosne. Paris 1812.

Faits et Observations sur la Fabrication du Sucre de Betteraves, par C. J. A. Mathieu de Dombasle. Paris 1822.

Améliorations à introduire dans la Fabrication du Sucre de Betteraves, par M. Nosarzewski. Paris 1829.

sumed is the produce of a plant which can be grown upon every farm; and manufactured by every husbandman; and true it is that but for a change in the fiscal laws of that country, all the sugar consumed from Brest to Lyons, from the Pyrenean mountains to the sources of the Scheldt, may, ere long, be derived, not from the labour of slaves, but from the industry of freemen in their native land. It is also true, that if all the countries of Europe shall follow the example which France has set, the cultivation of the sugar plant of the tropics for the supply of Europe, by the labour of bondsmen, must cease. And marvellous indeed will it be if, in the chain of events, France, which seized so eagerly the first occasion to resume that dreadful trade which the humanity of England had abandoned, should now be the first to prove that the labour of the African is no more needed to minister this luxury to his European oppressor. Marvellous indeed will it be if her great Emperor, himself the fiercest persecutor of African liberty, who bathed his laurels in the blood of its bravest defender, should have had the fortune to bequeath this legacy of mercy to the African race. In all that relates to the foreign trade in slaves, the honour of England is now without a stain; but if she has abandoned the dreadful trade, be it remembered that it has only been that other nations might take it up and carry it on with aggravated horrors. If the cultivation, then, throughout Europe, of an indigenous plant producing sugar, shall take away the inducement to carry on this trade of violence and crime, the experiment on the beet must be regarded as one of deep interest to humanity: And as it respects our own island, the result may have a near and important interest. The beet is as easily cultivated in England as it is in France; and as to the fabrication of the sugar, can it be doubted that this, as every other manufacture, could be as cheaply and perfectly executed in England as in any country? What the effect of the establishment of such a branch of industry might be with reference to the interest of the West India planters, will seem to many to be matter of inferior moment. It would be sufficient that it opened up a new field of profitable labour at home, and increased the enjoyments of the people. If it affected the interests of the West India planters injuriously, it would do so by no violence offered,—by no invasion of the

rights of property, but in the natural progress of events, by the blessing of Providence, and the progress of the arts. Our West India countrymen would have no more right to murmur than they would have to chide the bounty of the seasons. A destruction of the African slave trade, by taking away the inducement to carry it on, would be matter of gratulation to every man of right feeling; while the further result might be to better the lot of thousands of human beings in those rich and lovely Islands of the West, so blessed by the bounty of nature, so cursed by the avarice of man.

Alas! that we must dispel so pleasing an illusion. We have given insertion to the remarks on this subject, of one whose judgment we respect, and whose generous feeling we admire. But we have done so that we might present the subject and the argument to the reader in their most favourable aspect; that he might be enabled to form his own judgment upon the question,—nay, that he might, by a distinct account of the process of manufacture, be enabled to put the experiment to the proof in the commonest utensils of the kitchen. While we admit all the facts which our excellent friend has adduced, we are compelled to draw a different inference from those facts; and we feel it to be a duty to explain the reasons of this difference, lest we should be held for a time to compromise principles which we hold to be more important to the interest of this and of all countries, than the establishment of many manufactories of beet.

The history of this manufacture in France is an illustration, we apprehend, not of the natural progress of industry and of the arts, but of the effects of a system which counteracts the natural progress of both. Whatever may be the ultimate state of this singular manufacture, in consequence of mechanical and chemical improvements yet unknown to us, it is now only supported by a system of commercial and financial policy, which it is for the interest of all countries to see proscribed in Europe. The people of France were the first to be taught by their own philosophers those principles of mutual intercourse which form the basis of trade. Nearly a hundred years have elapsed since Quesnay and his followers taught his countrymen, that freedom of intercourse is the soul of commerce. But his countrymen have yet to learn that liberty is as necessary to the health of commerce as to the

well-being of the citizen ; that trade is but an interchange of things produced, and that if France will not take the productions of other countries, other countries will not and cannot take the productions of France. The cultivation of the beet, as we will endeavour to show, is but one ramification of that system of repulsion and exclusion which has been adopted in France, to the oppression of her domestic industry, the ruin of her foreign commerce, and the maintenance of false principles in the commercial policy of surrounding countries. The repulsive system of France has been pushed to its limits, and its effects rendered so palpable, that the most enlightened merchants of the country have declared against it. Memorials have been addressed by them to their own government, setting forth, that, under the system pursued, public industry languishes, and commerce is oppressed. As yet their reclamations have been vain. Reason is seen to be but feeble when opposed to the dogmas of incapable statesmen, backed by the ignorance and delusion of the multitude.

The principle of this shallow system,—a revival of the worst errors of the ancient mercantile school,—is protection to home-production, exclusion of foreign merchandise, to the utmost extent, and at every hazard. France can produce wool and iron, and silk and flax, and can work these into cloths and hardware, and, therefore, by prohibition and fiscal laws of every kind, she will protect these in her own country against all the competition of foreign industry. The result is shown to be disastrous, not by the abstract deductions of political economists, but by facts that cannot be controverted in the state of the trade and industry of the country.

Amongst the objects to be protected, when the events of 1814 reduced France to her former limits, and established other states in independence around her, was her trade in silk goods. The silk manufacture of Lyons was extensive and firmly established, and afforded the finest fabrics which Europe produced. The ministers of France still wished that the independent nations around them should buy their silk from Lyons, but then they would not receive in exchange for the silks of Lyons what those nations had to sell. They would have nothing but gold and silver, and the nations around had not gold and silver

to give. Between the French and the inhabitants of the opposite banks of the Rhine and the Rhone, an extensive trade was carried on in the native productions of the two countries, putting in motion the productive industry of either, and beneficial, as all trade must necessarily be, to those who are engaged in it. But no, said the statesmen of France; We will not take your oil, your cattle, your cheese; we can raise these things at home, and we must protect the industry of France against foreign competition. The inhabitants of Switzerland, who wanted silk, now found it necessary to manufacture it for themselves. Manufactories were established or extended in the Swiss cantons. In that of Zurich alone, the number of looms increased from 3000 to 10,000. The ribbon and other silk manufactures of Switzerland soon rivalled in cheapness of production those of Lyons itself; and the manufactures of Lyons fell into a state of embarrassment or decay from the failure of their export trade. Further, the silk trade of England, long fostered by prohibitive duties, was at length thrown open, on fair terms, to the competition of the world. The first effect was indeed embarrassing and distressing, as all such changes generally are; but the final result has been, that the silk trade of England has increased with a rapidity surpassed only by that of the cotton manufacture. Instead of requiring nursing and protecting, it has now become a sound and vigorous branch of domestic trade, capable of standing a competition with those countries of the south of Europe with which, but a few years before, all rivalry was deemed hopeless. The silk manufactures of England, in spite of many fears and predictions of ruin, are now able to beat the silk manufactures of Lyons in every market of the world. Nay, the silks of England,—with her cloudy skies, her muddy streams, her imputed want of taste,—have been recently smuggled into La Belle France herself, and seized as contraband there by her own custom-house officers—a practical lesson to them of the relative effects of free and restricted trade.

Then, again, the statesmen of France resolved to protect the iron-masters and iron-manufacturers of France. They had mines of their own, and why should they not produce their own iron, encourage the industry of their own countrymen, and render themselves independent of foreign supply? They did pro-

tect the iron-trade of France ; they laid duties nearly prohibitory on the iron of the countries around them,—of Spain,—the countries on the Baltic,—of England, and the Netherlands. They found they could not produce their own iron at less than 50 francs the 100 kilogrammes, while England could supply them with hers at 21 francs the 100 kilogrammes. It was therefore resolved to lay on duties and charges on foreign iron of 25 francs, which, with a further charge of one-tenth, made the whole duty 27 francs 50 centimes. This, it was asserted in the ministerial manifestoes of M. De St. Cricq, the then Solomon of the French exchequer, was a very reasonable and even necessary protection in favour of native industry. The consequence of this reasonable and necessary protection is, that while Swedish iron can be sold at the ports of France, free of duty, at 365 francs per ton, French iron of the same quality would cost 375 francs ; while English cast-iron could be sold at 152 francs, French cast-iron would cost 220 francs ; while the English iron of commerce could be sold at 207 francs, that of France would cost 462 francs.

Thus, to support the iron-masters of France—to protect native industry, forsooth—every consumer in France is subjected to a tax on the most important material of the arts. Without iron, which of the useful arts could prosper ? It is essential to the perfection of manufacturing machinery, to agriculture, nay, to the fabrication of the commonest utensils of the household. The carpenter, the mason, the cutler, and every artisan, and every consumer, are interested in having this material cheap ; and yet the statesmen of France will have it dear, in order that they may encourage the industry of France. Better were it for the industry of France, that all her iron-mines were sunk in the bottom of the ocean. With a population of twenty millions, the inhabitants of the British islands consume four times the quantity of cast-iron which those of France consume with a population of thirty millions. The owners and workers of the iron-mines of France, removed from foreign rivalry, make no effort to improve their practice. Their furnaces, we are assured by their own engineers, are so carelessly constructed, that they will scarcely smelt one-third part of what an English furnace will do. The rudeness of many of the mechanical instruments in

common use in France, and the wretched substitutes to which the peasants and others are forced to resort, are matter of surprise to travellers from this country; and, as may be supposed, France does not export one article of hardware to any country to which the better merchandise of England can reach. These things are not *matter of mere assertion*; their truth is verified by public documents, and by the recorded testimony of the most intelligent merchants and engineers of France*.

And what has been the result as affecting those iron-masters for whose benefit this preposterous tax has been imposed upon the industry of the country? They have been freed from foreign competition, it is true, but they have not been freed from the competition of one another. That competition has sufficed of itself to lower their profits, while the price of wood, and consequently of charcoal, the principal material employed in France in the smelting of iron, and forming more than forty per cent. of the whole cost of the material at the furnace, has been greatly raised. Thus, with the enhanced cost of production, without a corresponding increase of demand at home, and without any demand at all from abroad, the iron-masters of France are amongst the most distressed classes of the community. A great proportion of the new establishments, erected in consequence of the forced protection afforded them, have been ruined.

But this is not all: wood, as our readers know well, is the principal fuel consumed in France, and wood is the production of a generation, while its destruction is the work of a day. The sudden demand of the forges of France increased the consumption, and consequently the price, of this necessary of life. In some districts it rose fifty per cent., in some a hundred per cent., and in one—the Meuse—it rose three hundred per cent. in the space of ten years. Need we say that this is an effect which extends far beyond the sphere of the iron-master? It reaches to every manufacture, and to the domestic comfort of every consumer.

Nor is it to iron alone, but to every domestic production, that this system of prohibition extends. Calicoes and muslins can be produced in France, and why should the foreigner be suffered to interfere with the native manufacturer of calicoes and mus-

* *Enquête sur les Fers, &c.*

lins? The cotton manufacturers of France, accordingly, have been protected, and to their hearts' content; and the cotton manufacturers of France accordingly have been ruined. Production has been stimulated beyond demand at home, while no outlet can be found for the overplus abroad. The foreign customer naturally prefers goods that are cheap to goods that are dear. He cannot take his goods from the French customer, because the French customer will not take such goods in exchange as the other can give. The French consumer will not take the linens of Germany, and the German may have nothing to give in exchange for the calicoes of France, but the linens which his own country produces. The calicoes of France, therefore, are thrown a dead weight upon the country that produces them; and the manufacturer of them, freed from the rivalry of foreign skill, makes no effort to improve his commodity. Under the continental system of Napoleon, the cotton manufacturers of France were enabled to force their miserable cotton goods into the different countries of Europe. But now that other countries are as free as France is, they refuse to accept of her calicoes and muslins. They are stupid enough to prefer those of Glasgow and Manchester. The quantity of manufactured cottons exported from Great Britain, is, to that exported from France, in the proportion of more than twenty to one. And, as in all other cases, the effect of the cheaper production reaches to every home consumer. The inhabitants of Great Britain and Ireland use, one with another, twice the quantity of cotton fabrics which those of France consume, and obtain them at half the price.

The like remarks will apply to nearly all the domestic manufactures of the country, with the exception of a few, in which the French have long excelled, and may still excel, if they will not commit the folly of driving other nations to produce for themselves. Their woollen manufactures are sacrificed that they may protect the growers of wool; their linen-trade is in a still worse condition, and their hardware and earthenware are rendered dear to themselves, and on account of the badness of their quality, rejected by the rest of the world.

They have their corn-laws too as well as we, and without the same excuse. They will not even admit fat cattle but at an

enormous duty, lest fat cattle should interfere with native industry. Under this senseless system the consumer is oppressed, while, so far is the producer from being benefited, that the raisers of raw produce in France are in nothing behind their manufacturing brethren in their complaints of a want of demand for their goods.

Every one knows, that one of the most valuable productions of France is her wines. One-tenth part of the entire population is employed in the production of this commodity. A thousand millions of gallons are yearly produced, computed to be worth forty millions Sterling, and affording the chief internal revenue of the country. These wines are in universal esteem wherever they are known, and France would have a great part of the Old and New World for her customers, if she would but consent to take the goods which those customers could give her in exchange for her wines. She will not do so, and the consequence is, that the goods of the wine-growers lie an overstock on their hands in every department of France. In the Bordelais, producing the finest wines of Europe, the merchants complain that the price has fallen below the cost of production. Their claret has been sold at three-half-pence per bottle. They accuse the iron-system as the cause of the failure of demand. The iron-masters retort. Those who smelt with charcoal, accuse those who use the cheaper material, coal. Each interest, in short, accuses another of being the cause of its own suffering. It is not, however, one link of the chain that is defective. The whole is weak and worthless. The whole system is founded in error, and at variance with the primary principles which regulate the interchange of commodities.

Such, however, is the system which has found favour in this beautiful country, and amongst an enlightened people. It may be said that so much the better is it for us that so powerful a neighbour should pursue a system which is destructive to her own prosperity, and which must prevent her from ever rivalling us in commerce or maritime war. We answer, no. The industry of both countries suffers by this mistaken system; thousands of the labourers of either country, who, under a system of liberal intercourse, would find employment in ministering to each others wants, are now suffering from the want of employment. What

is the state of trade between two countries, so rich, so powerful, and so happily situated for a favourable commerce? We take from France about three millions Sterling worth of goods, a considerable part consisting of her wines; she takes from us about six hundred thousand pounds Sterling worth of British and colonial merchandise:—a ruinous commerce, some will inform us, seeing that the balance of trade is against us. The balance of trade is not against us; and we tell our readers that the balance of trade is a foolery and a bugbear, which ought never to be mentioned amongst well-informed men. No balance can ever be against a nation in trade, because no trade will be, or can be, carried on which is not profitable to those who carry it on. We take from France three millions Sterling worth of wines and other goods, and we send her the balance of our debt in specie; and how do we procure this specie? We do not get it for nothing. We must send for it to other countries that possess it, and we must give them something in exchange for it which we ourselves possess. For every ounce of gold and silver, then, that we send abroad, we have already given some equivalent in something the produce of our own land and labour. Instead of sending to France our iron, our hardware, or other commodities which we have produced, in exchange for her wines, we must send elsewhere our hardware and other commodities, and purchase with them specie, which we must carry to France to give her in exchange for her wines. If we cannot do this, and with a profit to the trader, the trade itself will cease. The traffic is merely more circuitous and disadvantageous; but it is disadvantageous to both nations alike: it is relatively disadvantageous in the same sense in which we would say that it is less advantageous to trade with a country at a great distance, than with one at our doors. We would not carry on this indirect trade with France any more than we would carry on a direct trade with her, unless we found it for our profit to carry it on. It would, doubtless, be greatly more extended, and, on that account, greatly more advantageous, if it were a direct trade—if France directly took our iron and hardwares in exchange for her wines. It is probable that, under this system, we should consume many times the quantity of the wines of France which we now consume, while England would export to France

many times the quantity of her own goods and manufactures, which she now exports. It is true that we do not now import one hogshead of those wines without sending abroad an equivalent in the commodities of England. But what would be the amount of these commodities, if the intercourse, instead of being circuitous, and loaded with innumerable charges, were unshackled and direct? The wines in most parts of France are sold at a rate which would render them an article of consumption by every class in England, while every class in France would receive in exchange those articles of consumption which England could supply them with, for half the quantity of labour which the inhabitants of France are now compelled to give in exchange for them at home. When we see the extent of trade which can be carried on with some comparatively poor countries, as Portugal, we must see how vast that traffic would be which could be carried on between two such great countries as France and England. It is a sin of either government, against their subjects, to interrupt the natural flow of capital which would give an increased employment to the industry of both countries.

But to return to the beet. The history of this singular manufacture in France is merely that, we apprehend, of one branch of industry fostered into a premature and sickly maturity, by the sacrifice of sound principles. It seems to be but one branch of the prohibitive system, and not the least curious of its ramifications.

The existence of a portion of sugar in the beet was discovered about the year 1747, in the course of a series of experiments on saccharine plants in general, by the celebrated Prussian chemist Margraff. This discovery was announced to the Scientific Society of Berlin, and duly entered upon its records, among other discoveries of a similar nature, there to remain in testimony of the genius of its author, and as one among many proofs of the services which he had rendered to science. It is said that he himself entertained the idea, that this discovery would one day give rise to a sugar manufacture in Europe; but whether he did so or not, it is certain that nothing of the kind was attempted at the time; and for the space of forty years after his memorial was published, the saccharine properties of the beet-root, which he had thus accidentally detected,

were never heard of beyond the pale of the chemical science, or declared in any way to the world, save through the medium of annual academical lectures. At the end of this period, the ingenious but visionary Achard, expressly with the view of ascertaining if beet-root could be used in the manufacture of sugar, resumed the experiments which his illustrious predecessor had commenced. His object was laudable, but the zeal with which he pursued it led him to conclusions somewhat extravagant. The fruit of his experiments, which were conducted with great ingenuity, was the discovery that beet-root contained not only a larger proportion of sugar than had been found by Margraff, but also a variety of other articles, such as tobacco, coffee, rum and vinegar, which had entirely escaped the notice of the latter *. We have not been able to ascertain the exact proportion of saccharine matter which Achard declared was yielded by the beet-root; but he calculated that one half kilogramme of raw sugar might be manufactured from it at a cost of about 30 centimes. Had this calculation been correct, the establishment of a beet-sugar manufactory would have been an extremely feasible and even profitable speculation; and, accordingly, the Royal Institute of Paris, with the view of erecting one in France, appointed a committee to inquire into the facts, and report upon them. This committee, which held its sittings in the year 1800, was composed of men of the highest scientific attainments, and the investigations and experiments were conducted with the utmost skill; but so unsatisfactory were the results obtained, both with regard to the proportion of saccharine matter, and to the cost of converting it into sugar, that all idea of establishing a manufactory was abandoned, and the fruit of Achard's experiments fell for the present to the ground.

* We extract the following passage, enumerating the discoveries, from M. Derosne's Introduction to the French translation of Achard's *Treatise on Beet-root*. "For in recounting the various commodities which M. Achard obtained from beet-root, there will be found, besides an extremely abundant forage, tobacco, sugar, molasses, coffee, eau-de-vie, rum, arrack, vinegar of two different qualities, and, lastly, beer; such results as enable us to pronounce the beet-root to be one of the most bountiful gifts which the Divine munificence has awarded to man upon the earth; for the famous cocoa of the Indies is far from uniting so many advantages as the beet-root."—*Traité complet*, &c. *Introd.* p. 23.

During the lapse of ten busy and important years after the investigation of the Institute, no more was heard of the sugar of beet. It was about the end of this period that well known political events, particularly the operation of the famous Milan Decrees, had deprived the Continent of all immediate supplies of the commodities of the West. To the French these commodities had become, by long and habitual use, almost necessities of life, and on this account the deprivation of them was felt as the greater hardship. Napoleon saw the dissatisfaction of his people, and, anxious to remove the cause of it, he bent his active and enterprising mind to consider the possibility of producing at home those articles of luxury, which, according to his political schemes, could not, for a time at least, be procured from abroad, save at high prices, and to the benefit of his arch-enemy, English Commerce. The Académie des Sciences was accordingly directed to appoint a committee to investigate the practicability of such a scheme. This committee, which was also composed of men highly eminent in science, was so successful in its inquiries, that very soon the cottons of America were supplied by those of Rome, of Spain, and Castellamare; excellent cochineal was produced by MM. Gonin from madder, and superior indigo was manufactured from woad, at the fabrique of MM. Paymaurin, Rouquet, and Giobert. But the necessary which, above all others, it was important to obtain was sugar. So full and unsatisfactory had been the inquiries made concerning the beet-root, by the committee of the Institute in the year 1800, that it was entirely overlooked in the present investigations of the Academy; and the various attempts which were made to produce sugar in a crystallized form from other materials proved utterly abortive. Manufactories, indeed, were established, at which sirups of different kinds and qualities were produced from raisins and honey, but these were found incapable of crystallization; and as sirups can be employed for but few domestic purposes, the want of sugar was still severely felt. Under these circumstances, M. Deyeux, a member of the committee, ventured to resume the exploded topic of the beet-root. In an ingenious essay read before the Academy in 1810, he exhibited the properties of the plant to such advantage, and argued the possibility of manufacturing crys-

tallized sugar from it with such ability, that it was determined at last, under the existing circumstances, to put its merits to a practical test. Napoleon gave orders that an imperial establishment should be erected forthwith, for this purpose, at Rambouillet; and crystallized sugar was shortly afterwards produced at this place in considerable quantities.

The Emperor employed every mean in his power to foster the infant manufacture. Imperial schools were instituted, for the purpose of giving instruction both in the principles of the art of sugar-making, and in the minor details of the process, as it regarded beet-root. The pupils of these, when they had gained a certain degree of proficiency, were sent as foremen and workmen to the different private manufactories: premiums were given by government for the best sugars produced; and, in short, all possible means were used for forcing forward this new branch of industry. The manufacturers, being without competition from abroad, did not fail, as may be supposed, to charge such prices as amply remunerated them for their labour and outlay. Money was rapidly made*; the manufacture was found to be an excellent investment, and was eagerly entered into by capitalists. This great success commenced in the year 1812, and increasing prosperity continued to attend the labours of the manufacturer, till the events of 1814 again opened the ports of France to the introduction of colonial commodities. The downfall of the beet-root manufactories was now as sudden as their rise had been. The arrival of foreign sugar swept every trace of them from the face of the country; only one or two individuals, whose fortunes, to use M. Du Brunfaut's expression, "were colossal," being able to resist the shock†.

Colonial sugar thus took possession of the market, and pro-

* M. Dombasle, talking of the various inducements held out to capitalists to embark in this trade, says: "But the inducement by far the most powerful, was undoubtedly the high prices of the sugar; in truth, at the prices then obtained, it required but the produce of one year's manufacture to cover all the original expenses of the establishment."—*Faits et Observ. &c. par M. Dombasle.*

† "Beet-root sugar received, from the introduction of colonial sugar in 1814, a check, which only those of colossal fortunes were able to sustain. This event annihilated our infant manufactories, and for the present deprived our agriculturists of the acquisition of this branch of industry."—*Du brunfaut, Introd. p. 11.*

bably that of beet-root would never again have been heard of, had not another opportune revolution taken place in its favour. In 1814, the sugars of the English and French colonies of India and America, were allowed to enter the ports of France at the same duty, 40 francs for raw, and 60 francs for fine, the 100 kilogrammes, without reference to their origin. This free competition tended to keep the prices low, and as long as it continued, no beet-root sugar could be brought into the market. Under this system, however, it was soon found, that the French colonial sugars themselves ran some risk of being driven from the field by those of the English colonies of America and India; and, accordingly, in December 1814, a law was passed, by which a protecting duty of 20 francs the 100 kilogrammes, was imposed upon all sugars of foreign origin. In consequence of this, an advance in the prices, though not very considerable, was occasioned, and a great increase in the quantity imported at the same time took place; so great an increase, indeed, that the importations, which, in 1814, were only about 7 millions, amounted, in 1816, to 24½ millions, of which not so much as 7 millions were supplied by colonies not French. This circumstance induced Government to levy an additional duty of 5 francs on French colonial, and to increase the protecting duty on foreign colonial, to 25 francs the 100 kilogrammes. The law of 28th April 1816, accordingly, fixed the duty on raw sugar at 45 francs, and on fine at 70 francs, the 100 kilogrammes. In consequence of this enactment, the prices rose very much, French colonial sugar being sold in 1816 at 92 francs the 50 kilogrammes. It is from this year that we must date the revival, though feeble and undecided, of the beet-root manufacture. By the law, 7th June 1820, which increased the tax on foreign sugars still farther from 70 francs to 75, it received an additional impulse; but it was not until 1822, when this tax was at once raised from 75 francs to 95, thus establishing a surtax of 50 francs the 100 kilogrammes, that the manufacture of beet-root sugar began to make such progress as to render it worthy of serious attention*. Since that period the quantity produced has been

* Néanmoins, ce n'est que depuis la loi de 27 Juillet 1822, que ses développements ont mérité une attention sérieuse. Enq. Rap. p. 44.

yearly on the increase; and, in 1829, there were 101 manufactories in active employment, which, together, sent into the market 4,835,000 kilogrammes, nearly a sixteenth part of the whole consumption of France*.

Such is the plain account of the origin and present state of the beet-root sugar manufacture in France, from which we may trace each step of its progress since the discovery of Margraff, and mark the causes that led to each. We find that the existence of the saccharine properties of this plant, has been known in the scientific world for very nearly a century. Owing, however, either to the quantity or quality of the sirups obtained, forty years were allowed to elapse before even the idea of manufacturing from them was entertained; and it was only at the end of this long period that the curiosity of the public was raised by the fanciful reports of a visionary chemist's experiments. But the desire of embarking in the speculation of a sugar manufacture, which at that time began to evince itself, was quickly dispelled, when the true state of the case was calmly investigated by the French Institute, and the results of these investigations laid before the public. After this we find that the subject was once more consigned to rest for another series of years, at the end of which it was again agitated, at the command of Napoleon, to meet the existing exigencies of the country. It was then that the manufacture was first established, and forced into a state of ephemeral prosperity, by the necessities of the people, and the unwearied encouragement of the Emperor, at a time when sugar could scarcely be obtained at all, and the small portions that were brought into the market had risen to a price nearly five times greater than what they had borne during the previous part of the war. This prosperity, however, was of short duration, and no sooner was the indigenous manufacture exposed to competition from abroad, than almost every trace of it disappeared from the country. Nor was it till after the establishment of that fatal system of commerce, of which we have said so much, that it was called once more into a state of feeble existence; nor was it till after that system was carried to its present degree of extravagance, that the manufacture became considerable enough to attract

* Enquête, pp. 3-146.

great attention, and to alarm the government for the revenue derived from the colonial sugar. The beet-sugar manufacture is now flourishing ; but to what circumstance does it owe its prosperity, nay its existence? To this alone, that while the sugar of the French colonies is loaded with a heavy duty,—while that of all the rest of the world is loaded with a prohibitory duty,—this home-made sugar comes into the market free of every fiscal charge. A simple act of justice rendered to every consumer of sugar in France, a reduction of those extravagant duties which enhance to every consumer the price of a necessary of life, would sweep from the face of the country every trace of this manufacture. Let us listen to what the manufacturers of the commodity themselves say in answer to the merely equitable proposal of laying a duty upon it, to make it supply a portion of that revenue which would else be derived from the colonial sugar. “ The manufacturers,” says the report, “ unite in demanding the continuation of the protection, which results from the combination of the existing tariffs. They acknowledge that beet-root sugar will be able, and ought to be made to bear, *one day* the imposition of a tax ; but they affirm, that, by subjecting this production at present, not to the duty to which the colonial sugars are subject, *but to any duty whatever*, the whole existing manufacturers will be ruined, and the establishment of all new ones prevented *. By so precarious a tenure, then, are the manufacturers of beet-root sugar suffered to exist in France. A return to common sense on the part of their rulers,—a diminution of an exorbitant duty on a commodity which their own colonies, and the whole intertropical regions of Asia and America, could supply cheaper and better,—an equitable tax even upon the commodity produced,—would annihilate every manufacture of beet from the Pas de Calais to the Mediterranean shores.

To support two miserable islets called Martinique and Guadeloupe, and another more insignificant still, called Bourbon,—all of which England, by a rare act of stupidity, surrendered at the peace without necessity, and without equivalent,—the French Nation is contented to limit the supplies of her colonial

* Enquête Rap. p. 50.

sugar to these trifling colonies ; and this M. St Cricq and his followers inform us is by way of creating a nursery for French seamen. A nursery for French fiddlesticks ! Were it not a better nursery for French seamen to open up a trade with all the islands of the West Indies, with the Brazils and with Asia. Cuba, Jamaica, and other islands of the West Indies, would supply them with sugar better and cheaper than those rocks of their own miscalled colonial possessions. But this is not all—the sugar of the favoured colonies must be farther raised by duties to the value of their beet-sugar, and, for the benefit of the latter, sold to the French consumer at a price which renders it impossible for the mass of the people to consume it at all. The great consumption of sugar in France is in the capital. In the provinces, and amongst the poor, it is so small, that the average yearly consumption of the whole inhabitants of the country does not exceed four pounds per head. In Great Britain and Ireland, the consumption is 14 lb. per head ; in England and Wales alone it is 22 lb. per head ; the revenue produced is nearly L. 5,000,000 Sterling ; the total revenue raised from the produce of the colonies being about L.7,000,000.

Are we prepared, then, to adopt a system which would sacrifice the revenue of the state, the shipping, and the trade of the colonies ? The import duty on our colonial sugar, we have said, alone produces a revenue of about L. 5,000,000 Sterling, a tenth part of all the revenue of Great Britain. The colonies afford employment to 263,000 tons of shipping, to 14,000 seamen, and consume L. 4,650,672 Sterling worth of the manufactures and productions of the mother country ? Are we prepared to reject this great national boon, that we may pamper into sickly existence a manufacture which, on equal terms, could not enter into any competition, with respect either to quality or price, with a material which we can get in inexhaustible plenty from our dominions in either hemisphere ?

If the beet manufacture of sugar were to be established in this Island ; every principle of good policy,—every feeling of justice towards our fellow-subjects in the West Indies,—would demand a diminution of the exorbitant duties to which the sugar of the colonies is now subject. We could claim no right to tax the sugar of the colonies, on the ground that they should

be made to contribute their proportion of expense towards the state. We cannot agree with this part of the argument of our ingenious correspondent. In consuming from L. 4,000,000 to L. 5,000,000 Sterling worth of the manufactures of Great Britain,—nearly a tenth part of the whole exports of the domestic productions of the country,—in giving employment to a vast body of labourers in the preparation of those materials,—and to 263,000 tons of shipping, and 14,000 seamen,—the colonies afford such indemnification as never colonies before afforded to the parent state for the protection afforded. Besides, what would the value of that protection be, if the mother country took the means to ruin her dependencies?

If the West India colonies were abandoned by their white inhabitants,—if half their cultivated surface were restored to a jungle,—if the commencing civilization of their black population were destroyed,—would not Cuba and the Floridas, the Brazils, and other countries, be ready to supply us with sugar? We could not argue that *they* were bound to pay us a tax for the protection we afforded them. Or, if we should look to Asia, to our boundless empire there,—now, it is to be trusted, about to be released from the trammels of a hideous monopoly, and laid open to the enterprise of British subjects,—we should find the means to supply our own, and every market in Europe, with sugar at a rate which no manufacture of the indigenous sugar could withstand.

After this long detail, we will not now lead our readers into the agricultural part of the question, by showing how little expedient it would be to cultivate such a plant as the beet, for the sake of its sugar, in place of the potato, and other useful plants, which are now produced upon every farm. One of the arguments used by the beet-cultivators in France, is, that they have not animals in that country to consume the weeded crops, the *récoltes sarclées*. Nothing could be less applicable to Great Britain than such a remark. Every one knows that we have need of all our *récoltes sarclées* to keep our lands productive, and to feed our domestic animals.

With regard to West India slavery, this indeed is an important question; but it is one, we conceive, with which the question of the cultivation of beet has little connexion. We cannot believe

that the lot of the Negro inhabitants of the West India Islands would be benefited by taking away the demand for one of the main productions of their country. It is not, we conceive, to the distress and ruin, but to the prosperity and happiness, of those countries, that we should look for the means of improving the condition of their African population. Were we to ruin those noble colonies, what would this do but afford to other countries the opportunity to profit by our unheard of folly, and establish their own colonies on the ruin of ours? What would humanity gain by the transference of the cultivation of the sugar-plant from Jamaica to the Floridas, from Trinidad to Cayenne? Would the ultimate prospects of the African race be brightened by destroying the nascent germ of improvement amongst them in the colonies of Britain, that their countrymen might be reduced to a more hopeless bondage in the colonies of other countries? While we would force upon the Legislature of Great Britain those rash and dangerous measures which we every where hear demanded, ought we to have no feeling for the misery we should inflict upon our countrymen at home? The colonies in question now support one main stay of the maritime power of Britain; and, by the consumption of her domestic productions, afford support to some hundred thousands of her own labourers. Is the situation to which these would be reduced, unworthy of our thoughts, while we feel so sensibly, and would redress so promptly, the wrongs of the African? In the natural course of events, with temperance and good policy, the African inhabitants of those countries will be gradually improved in their condition, and ultimately restored to that freedom of which their forefathers were unjustly deprived. But miserable indeed were the sentimentality which would urge the government headlong into a course which would produce so much of public and private evil, and be matter of triumph to all the enemies of the country.

If we know ourselves, none can feel more entire abhorrence of the very name of slavery. That slavery is a horrid outrage upon every natural feeling,—that nothing can be imagined more repugnant to humanity and reason than the violent captivity of our fellow creatures,—no man of right feeling will deny. But the question with relation to our West India colonies is not

whether slavery be cruel and unjust, but how we can best improve the condition of a race of men placed by circumstances in a state of slavery. Would this be done by taking away the demand for the commodities which the country produces,—by destroying the capital which would be needed to support the labourers were they free? What would be the effect of such freedom as is now demanded, to these poor people, known to be so improvident and helpless. It would be to render them the most wretched labourers in the world; perhaps to convert their country into a desert, and drive themselves again into the savage state. It would be, as in Hayti it was, to make them the most oppressed of subjects; or, as in Cayenne, to cover the beautiful countries they inhabit, with troops of marauders, whom armies would not restrain from violence. We differ from many worthy persons upon this question, who look to the end, without, we fear, regarding the means. If our object is to convert the West India population into free labourers, one of the first inquiries of reasonable men should be, How they shall be supported as labourers, when free.

KELP—BARILLA—ORDERS IN COUNCIL.

THE adage, as true as it is old, that one-half of the world does not know how the other half lives, is one which should be always before the eyes of our statesmen and political economists. It should be the *vade mecum* of our ministers for home affairs. It should be painted and hung up in the cabinet. From want of consideration for this practical maxim in human affairs, principles undeniably correct and just in themselves, and therefore well adapted to promote the general good to the utmost extent of their influence, may in legislation be so applied as to produce a greater mass of immediate misery and distress in the community, than can be justified by all the benefits which are expected to result to the community from their application. Small advantages may be bought too dear. Of this nature is the late Order in Council for reducing the import duty on barilla. It was noticed by Sir George Clerk, in the House of Commons, as a very singular interference with existing acts

of Parliament, and one not apparently called for by any state necessity: it was justified by precedents of similar interference, by Orders in Council, with existing duties or regulations which it was intended to abolish. The interests involved in the measure were either not understood, or were lost sight of in the discussion of the constitutional exercise of an interference with acts of Parliament, without adequate state necessity, by Orders in Council. This discussion belongs to politics with which we have little to do; that of the interests involved belongs to political economy, practically applied to the affairs of this country, and comes peculiarly within the sphere of this Journal. Many of its readers must be very little acquainted,—as little perhaps as the Board of Trade,—with the subject; and they who are more acquainted with it must be allowed to offer in their behalf a little preliminary explanation.

Mineral alkali is used in various manufactures. It is not, however, the basis or principal constituent of any, except of soap and of glass; and in these manufactures it is very extensively consumed. The mineral alkali of commerce is supplied from three sources;—from manufactories in this country, in which it is extracted from common salt, either as a primary or as a secondary object connected with the processes carried on for other objects; or from the incineration of certain plants growing in salt marshes on the coasts of the Mediterranean, principally of Spain, which are cut, dried and burnt, in pits by the peasantry, and, under the name of Barilla, imported into this country; and, thirdly, from the incineration of certain plants growing upon the rocks of the western and northern coasts of Scotland, and on the coasts of Ireland, which are cut, dried and burnt, in the same way as barilla, by the inhabitants of those districts, and sent to market under the name of kelp. The quantity of pure alkali contained in these products—kelp, barilla, and mineral alkali from salt—is the measure of their value to the manufacturer who uses them. Now there can be no doubt of the correctness of the principle, that the consumers of mineral alkali ought to be supplied with mineral alkali from the cheapest source; that, in as far as the well-being of the community is connected with the use of mineral alkali, the general good is promoted by the free introduction of the cheapest mineral alkali

into the market, however hardly such a measure may press upon any class of manufacturers who live by producing a dearer alkali. In the abstract, the principle may be admitted to be correct: in the application, however, it is necessary to show that the good is obtained without the sacrifice of greater or of equal good; that it is not bought too dear,—that is, at the price of a greater quantity of distress to a greater number of the people of the country, than is overbalanced by the benefit arising from its application to the rest of the community. It is also necessary to show that the good is really obtained by the ultimate consumer, the public; and not arrested on its way, and merely made a gain or profit to one class of manufacturers or merchants, at the expense of another class of manufacturers or merchants.

Let us look at the interests involved on each side. The manufacture of kelp occupies a great number of hands: it requires about 30 cwt. of the plants, as they are cut from the rocks, to make 1 cwt. of kelp; and, as the cutting, carrying, spreading, drying, and burning, can only be done by hand-labour, and only in few instances admit of horses being used, there is perhaps no branch of industry in the kingdom which directly employs so many people in proportion to its small value. In the Hebrides, and in the Orkney Islands, it may be said to be the sole productive labour and dependence of the inhabitants; of 40,000 people in the former district, and of 20,000 people in the latter. In Ireland, the number of people who depend upon this manufacture, is probably not less than in Scotland. The earnings and mode of existence of those people are, in Scotland, the following:—Kelp-making became general on the coasts of Scotland soon after the year 1745. The proprietors in the interior of the Highlands began about that period to clear their estates of superfluous population, and to consolidate small farms into large. In the districts above named, where, from insular situation, and want of communication, neither cattle-breeding nor sheep-farming could be carried on to advantage,—nor corn-farming, from the want of climate,—the manufacture of kelp sprung up in time to give employment to the population, and to make it the interest of the proprietors to continue the small farms, and the occupancy of numerous cottagers on their estates.

The lands in those districts are very generally occupied in the same way as they were 200 years ago ; or as the Highlands would have been if no cattle-farming, sheep-farming, or other agricultural improvement had ever been introduced into the Highlands ; but with this essential, and not-to-be-forgotten difference, that, instead of being occupied by an idle population, consuming what it produces, and not producing what will pay for what it consumes, the land is occupied by an industrious manufacturing population, producing, by its labour in the kelp manufacture, what pays for the agricultural produce it raises and consumes. The land is occupied in small farms, of from 7 to 15 acres, which, with the assistance of the hill-pasture, give food for two or three cows, potatoes, and meal for a family ; and to each little farm belongs a portion of sea-shore, producing annually a known quantity of kelp. The rent depends, both for its payment and for its amount, upon this portion of the farm. A man can support a family, and with even greater abundance of animal food, milk, meal, and other sustenance, than falls to the share of the labouring class in more cultivated districts ; but, if he occupied three times the extent of land, he could pay no rent without his kelp-shores, from want of market for his produce. The price, therefore, to the proprietor, is not merely the price per ton which he allows for making the kelp, but it is the rent of his land. If he gives L. 3 Sterling per ton for making kelp on a particular portion of shore, the farm to which that portion belongs pays a rent in proportion. If he lowers the price to 20s., or raises it to L. 5, the rent must be raised or lowered accordingly ; and, if he cannot pay for making kelp at all, because the market is supplied with cheaper alkali from Spain, he must turn out these kelp-tenants, and ship them across to wander over Scotland and England in search of labour, at a period when the inundation of cheap labour from Ireland is felt by every labouring man in Great Britain. This is the situation in which property, employing and supporting 60,000 people in Scotland alone, is placed, by an unexpected Order in Council. The wisdom of such a measure, if it were even borne out by the clearest, the most important, and most immediate advantage to the public, would be very questionable. Mineral alkali, although useful or even essential in many manu-

factures and processes, as, for example, in bleaching, bears so small a proportion, in all but soap and glass, to the other constituents used or worked upon, that the diminution in price to the public, of any one article, by the reduction of the cost of mineral alkali, can scarcely be appreciated or named.

It would puzzle the Board of Trade, if called upon, to point out any one article of general consumption, soap and glass excepted, and of these we shall speak hereafter, which can either now or hereafter be diminished in price to the public, by this Order in Council; and it is impossible for them to deny, that the means of living of many thousand people are compromised by it. If Mr Poulett Thompson does not explain what urgent State necessity called for an Order in Council to reduce the duty on barilla immediately, and to substitute Spanish kelp for Scotch and Irish kelp in the market, without waiting until existing acts of Parliament could be debated upon, and repealed by Parliament, the Irish and Scotch proprietors and makers of kelp can only conjecture, that some speculating merchants or manufacturers in London have been importing barilla, and have got the ear of Mr Poulett Thompson and the Board of Trade, and persuaded them to admit their speculation into the market at a lower rate of duty, under an Order in Council. Those who suffer by this measure are entitled to conjecture, that Mr Poulett Thomson and the Board of Trade were in the most innocent and total ignorance, that the employment and means of existence of 60,000 people, and the property of the inhabitants of 4224 square miles of the Island of Great Britain alone were involved in the consequences of this Order in Council, as well as the interest and profits of a knot of barilla merchants and soap manufacturers in London. Grave and prudent men will say, that, let the principle,—the abstract principle in political economy,—be ever so correct, decent regard for property,—decent regard for the unavoidable distress to a large mass of population, resulting from any diminution in their usual employment in these times,—decent regard for the constitution by a Whig administration,—ought to have prevented the doing suddenly, and in the dark, by an Order in Council, what ought only to have been done in Parliament, in the face of day, and before the nation, after the most serious deliberation, after hearing the inter-

rests concerned on both sides, after deliberately weighing the advantages to be gained by the public, against the evils to be inflicted on a portion of the community.

But soap and glass, we may be told, are articles of prime necessity in civilized existence. Mineral alkali is the principal constituent in these two articles. If the public is to be served more cheaply with these two articles, it was a sage and just act of legislation to reduce, even by an Order in Council, every impost-duty, every restraint upon the introduction of the materials for manufacturing soap and glass. It is a principle, we may be told, which cannot be questioned, that the public is entitled to be served from the best and cheapest markets, and that local and partial interests must give way before the general good, in which all partake, of being furnished with the best articles of use or luxury at the cheapest rate. On this principle, it is unquestionable that the reduction of the duty on barilla is a wise and just measure, suffer by it who will, provided the consumers of barilla, the public, obtain by it a cheaper, and consequently better, supply of soap and glass, in consequence of it. But if the measure stops short in its effect of this, if it merely transfers what were the profits of one set of manufacturers, the kelp-makers, to another set of manufacturers, the soap and glass makers; it is neither more nor less than a job, to which the Board of Trade has unintentionally lent itself; a mere manœuvre, from which the public derives no benefit, and by which one class of people is ruined, to give a profit to another class, without any advantage to the ultimate consumer, the public. Now, let us look at the state of the soap and glass manufactures in this country.

By the operation of the heavy excise-duties payable by the manufacturers of crown-glass and of soap, the manufacture of these articles is, in effect, a monopoly in the hands of a few large capitalists. The manufacturing industry, and ordinary manufacturing capitalists of the country, are as effectually shut out from making soap or crown-glass, as if these manufactures were carried on under an exclusive patent. In glass-making, for example, the raw materials to be worked upon—sand, kelp, coals, clay—are among the cheapest and most abundant that nature furnishes in these islands; and next to the useful metals, glass is perhaps the material most extensively useful, wheresoever the

habits of civilized life have penetrated; yet, to our more than seventeen millions of people in Great Britain and Ireland, we have only about seventeen crown-glass manufactories! What would the world say, if we had only seventeen iron-founderies in the kingdom?—or seventeen cotton-mills?—or seventeen broad-cloth factories? We might have no more, if it required a capital of L. 30,000 or L. 40,000 to meet the excise-duties upon these articles, over and above the capital required to produce them, in even the smallest scale of business in which the manufacturer could engage. This is precisely the state of the crown-glass manufacture. If the excise-duty were taken off, people would make glass as they make iron. They would apply it to purposes not now thought of. They would make it suitable for foreign markets, in which British glass is now laughed at. Let any man in this country attempt to put a French window in his house, a window with panes of glass equal in size to what he finds general on the Continent in every ordinary dwelling-house, from St Petersburg to Calais, in every inn, in every shop; he will find, that unless he takes plate-glass at an enormous expense, he cannot be supplied with panes of glass of the dimensions used abroad. The home market is sufficient for the extent to which our excise laws limit the exertions of the glass manufacturers. The foreign market, although we have all the means of supplying glass of every sort cheaper to the Continent than it can be made where wood is the fuel, is necessarily neglected. It is pretty obvious, that, with the manufacture of crown-glass in this state of monopoly, the advantage of a reduction in the price of mineral alkali by this Order in Council, does not reach the public. It is merely an additional profit, or saving to the glass manufacturer, at the expense of the kelp manufacturer. We shall proceed to prove it. The duty on barilla was 11s. 4d. per cwt. until about 1824, when it was reduced to 8s. 10d., and afterwards to 5s. per cwt. The price of kelp, on an average of twenty-five years previous to 1824, was 10s. 7d. per cwt.; and after the reduction of the duty on mineral alkali in the form of barilla, the price of mineral alkali in the form of kelp fell about 50 per cent. What was the fall in the price of glass to the public in consequence of this reduction in the price of the material? It appears by a memorial of the

glass manufacturers for a reduction of the window-tax, that the consumption of glass for a series of years, as was proved by the receipt of excise-duty, had been stationary, or rather advancing yearly, although not in the same ratio as the consumption of bricks and other building materials. Now, if the consumption and yearly demand for glass was stationary, or rather increased yearly, and the price of the material for making glass was diminished during that period nearly 50 per cent., the price of glass to the public ought to have been diminished also; or, if the price of glass was not diminished to the public, the reduction in the price of the material, by taking off the impost-duty on barilla, was a mere transfer of profits, by the juggle of an act of Parliament, from the kelp-makers to the speculators in barilla, or to the manufacturers of soap and glass, without the shadow of a benefit to the public, from a measure which necessarily produced great distress, such as a decided and great benefit to the public could alone justify, to a large mass of the labouring population.

It is for Mr Poulett Thompson and the Board of Trade to show that the public gained such an advantage in the price of glass by the first reduction of the price of kelp, occasioned by lowering the impost-duty on barilla from 11s. 4d. to 5s. per cwt., that it was expedient to lower it still more by an Order in Council. If no reduction can be shown in the price to the public, of the articles in which mineral alkali enters, it is merely a job of one set of manufacturers at the expense of another. Soap, considering that it is an article of the first necessity, and of the easiest manufacture, one that would be made in every private family in the kingdom, if the excise laws permitted it to be so made, is, by the operation of the excise duty, almost in the same state of monopoly. There are but a very few hundred soap manufactories in the kingdom for the supplying of the population with this important necessary of life. If the manufacture of soap was free,—if every old woman could, without fear of the exciseman, turn over her kitchen grease into a tub of alkaline ley, and on washing-day take out her own household soap, the reduction on the duty on barilla would be a benefit to the public which ought not perhaps to be postponed for any consideration of local or partial interests. One-half of a day's wages

in every week, is probably required by every labouring man who has a wife and children, and keeps them decently clean, to pay for the soap consumed in his family. If this necessary of life were rendered cheaper by the reduction of the impost-duty on barilla, the kelp manufacturers would have little just cause to complain of the measure. It would be a great public good, gained, no doubt, by the sacrifice of his interests as an alkali maker; but there would be a free and open market for his alkali, and it would find its relative worth and value. At present he is obliged to go with his kelp into a market filled with Spanish kelp or barilla, and in which no competition of buyers is allowed, the number of buyers being limited by the operation of the excise duties to a very few. Is it just to say to him, you must submit to a competition of price with the maker of Spanish barilla in the market, but this competition is to extend only to you, the sellers of alkali? There is to be no competition of buyers of alkali in the market more than before; they are to preserve their monopoly; you are to bring your kelp to a close market, in which there are only seventeen buyers for the glass trade, and a very few for the soap trade, considering its extent, being the same number of buyers as when kelp alone was in the market, and are to give to this limited number of buyers the benefit of a market fully stocked both with kelp and barilla, in which they are to be the sole purchasers. It is evident that, in common justice, in common sense, the free admission of alkali into the British market must be accompanied by the free use of that alkali by the British public: it is otherwise nothing but a job in favour of a few manufacturers from which the public derives no benefit. If the manufacturers of glass and soap are thrown open to the industry and capitals of the country, if glass of every kind could be made in Great Britain as on the Continent by any who have the materials of glass-making,—if soap could, like the much more complex and different manufacture of beer, be made in every village of the United Kingdom, the growers of kelp would have no just cause to complain. They would find a fair and just value for their produce, as compared with other alkaline products. They would not have to say, as now, of this one-sided act of legislation, or no legislation,—this order in Council,—that it gives an undue advantage to a few manufacturers of

soap and glass, and a few importers of barilla, at the expense and to the distress and ruin of many thousands of the most helpless and destitute inhabitants of Great Britain, without any benefit to the rest of the public.

If the free-trade system is to be acted upon with regard to alkali, it ought to be fairly and entirely acted upon. It is not doing justice to its principles, which we advocate to the utmost extent to which they can be reasonably carried, to act partially and delusively upon them, by hasty unexamined measures, which, under the disguise of free-trade, are in truth but schemes to favour the monopoly and speculations of the few at the expense of the many.

MISCELLANEOUS NOTICES.

1. *On the Farinaceous Aliment obtained from Straw.*—We adverted in our last Number to the conversion into a species of bran, or *farine*, of the straw of the cereal grains, and mentioned that two individuals in France claimed the merit of the discovery. In a letter, however, from M. Limouzin-Lamothe to M. Le Baron de Silvestre, Secretary of the Royal and Central Society of Agriculture, it is stated that the discovery is not a new one, but was made at *Castelnaudary* in the year 1608; and a copy of the original receipt, or account of the process, is given by M. Limouzin-Lamothe. In this receipt, it is proposed that the bran shall not only be used as food for domestic animals, but, if need be, made into bread for the food of man. The following is a translation of the old manuscript:—"To make bread without any kind of grain, by which one man may, by the grace of God, support forty men and ten horses a day in a time of necessity, which may be continued for six months or more, from a substance easy to be found in every place, and which bread will be found good and nourishing, and approaching to that of rye.—First, you must take some straw, which it will be necessary to cut with scissars, or a knife, as finely as possible, from a quantity of which, equal to a measure, or bushel, you will be able to obtain eight or ten loaves, weighing a pound. This quantity being ground in a mill, is leavened like the other flour of grain; and to knead it, there must be put into the water about the weight of two crowns of gold of ginger, reduced to powder, to season the bread, and this done, it is put into the oven and baked like the bread of wheat; and if it is wished to make bread sufficient to support forty men for a day, a quantity of straw equal to six measures, or bushels, must be prepared and ground, leavened and kneaded, as aforesaid. The said receipt has been verified and found good by us the undersigned Consuls at Castelnaudary, the 1st day of December 1608; De St Lerm, Consul; Brugilles, Consul; De Lannes, Consul; Meflier, Consul; by command of the said Consuls, Boyer,

clerk." Upon this singular document M. De Silvestre makes the following remarks:—From this process, it follows that it has been known for a long time that there exists in straw a nutritive substance, which is not perhaps the straw itself, but is found in its tissue; or else it is possible, that, by the action of the mill, the force of pressure, the rapidity of the movement, and the heat which results from it, there is produced a modification in the parts, a new combination, in a word, altogether different from what existed in the original straw. I am the more disposed to arrive at this conclusion, seeing that the constituent principles of certain bodies will undergo a change in their form and nature, by the different processes to which they are rendered subject—Glue, for example, in certain fruits and barks, gluten in wheat, butter, indigo, &c. When a potato is strongly boiled the substance is divided, and becomes impalpable between the fingers. It will be said that this substance previously existed in the parenchyma of the tubercle, and that there is now no more immediate contact between its particles to produce coherence and adhesion; but to this it may be answered, that this starch, previously extracted and boiled in water, would have formed a much thicker paste, and much more homogeneous, than the potato boiled and reduced to paste; whence it follows, that the starch, or fecula, isolated from the body which contained it, is formed by coction differently from what it would have been had it remained in the body itself, and then been boiled. A similar application, it appears to me, may be made with respect to straw, and the preparation which I have described; at all events, the question is sufficiently interesting to deserve to be fully investigated.

2. *Natural Provision for maintaining the Proportion of the Sexes.*—Professor Hossacker, in a letter to the Editor of the Medical Gazette of Inspruck, shows, that, in proportion as the age of the married male exceeds that of the female, the proportion of boys born to girls increases. In cases where the father was from nine to twelve years older than the mother, the male children were to the female, as $123\frac{7}{8}$ to 100; when the father was eighteen years or more older than the mother, the male were to the female children as 200 to 100. Is not this a marvellous provision of Nature? The object to be promoted is to supply the deficiency of males, the male parent having lived without propagating the species, and the result being the same as if the male had not lived, or as if there had been fewer males.

3. *On the Substance termed Uimin.*—This substance deserves attention in agricultural science, from the uses which it is supposed to serve in the vegetable economy. It has been conceived to be an acid having the power, like this class of bodies, to combine with bases. It nearly agrees in its composition with gallic acid; it is produced in nature in large abundance, and numerous vegetable substances are constantly being converted into it. It is found in great quantities in turf and other vegetable soils, and may be procured by the action of sulphuric and muriatic acids upon various vegetable bodies. Its existence in vegetable earths, manures, and the sap of plants, seems to indicate its importance in vegetation, and may perhaps tend to resolve some questions relating to the yet unexplained action of manures, and thus lead to some useful practical conclusions.—See *Annales de Chimie*.

4. *Agriculture of Africa.*—Agriculture, including pasturage, forms the most

important branch of industry in every society, and more especially in one where all the finer arts are yet in a state of infancy. In Africa, however, both the extent of cultivation and the processes employed are still extremely imperfect. This is particularly manifest from the fact, that no private property in land has been any where established. Every city or village is encircled by an unoccupied domain of forest or waste, belonging to the king or the state, and of which a portion is ready to be granted to any one who will undertake the labour and expense of cultivation; while the remainder forms an immense common, on which all the inhabitants have the liberty of pasturing their cattle. There are, in Africa, no country-seats, no rural farms, such as embellish the aspect of a European landscape; and which, in fact, could not exist in safety, where each little state is begirt with hostile neighbours, and so many predatory bands are prowling in every direction. The population is collected in towns or large villages, round which a circle of cultivation is formed; while, beyond, are pasture-lands, where numerous herds are fed and watched by day as well as by night. The space within the walls forms a pretty wide district, where, even in the largest cities, the houses are interspersed with cultivated fields, and the low roofs are seen rising behind ears of corn. All the processes of preparing the ground, sowing and reaping, are slight and simple. The plough has not passed the limits of Barbary; and, perhaps, in tropical climates, the deep furrow which it lays open, might expose the soil too much to the parching effects of a burning sun. Grain is raised only by means of the most profuse moisture, which, of itself, softens the earth. As soon as the periodical floods have deluged the ground, or the temporary river-inundation has retired, the labourers walk forth; one slightly stirs the earth with a hoe, while another, close behind, deposits the grain. Frequently this toil is lightened, from being performed by the whole village in common, when it appears less a scene of labour than a gay festival, like our English period of reaping. The village musician plays the most lively airs; the labourers keep time to his tune, and a spectator at a little distance would suppose them to be dancing instead of working. Irrigation in all tropical climates is the grand source of fertility; and wherever industry has made any progress, very considerable pains are taken to collect and distribute the waters, which either fall in rain or are conveyed by river-channels. Egypt is well known to owe its fertility altogether to the canals which diffuse over its plains the water of the Nile; and in Nubia, where the current remains constantly sunk in its rocky bed, there is a succession of *sahies*, or wheels, by which it is raised, and conducted over the adjoining fields. In this way a belt of cultivation, of about a mile in breadth, is perpetuated along the whole upper course of that great river. In all the tropical and more arid regions, the prevailing grains are of inferior character, coarse and small, rather, as Jobson says, like seeds than grains, and fitted less for bread than for paste or pottage. The dhourra is the most common, extending over all Eastern Africa; while millet in the west, and teff in Abyssinia, are productions nearly similar. In the latter country, and Houssa, both wheat and rice are raised, but only in favourable situations, and for the tables of the more opulent. Perhaps the greatest exertion of agricultural industry is that bestowed upon the culture of the manioc, which forms the main article of food in Congo, and some of the in-

sular territories. Considerable care is required in rearing it, and cleaning the ground round the plants; after the root, which is the valuable part, has been dug up, it must be ground in a species of mill, and dried in small furnaces, before it can be used as flour.—*Edinburgh Cabinet Library, Vol. II. Africa.*

5. *Pruning of certain kinds of Trees.*—In the *Annal. de la Soc. d'Horticulture de Paris* August 1829, M. Marcellin Vetillart describes what he calls a new method of pruning poplars and oaks. His principle is, that the fibres of the root bear always a certain relation to the leaves, and that the development of the one is intimately connected with that of the other. This he illustrates by the case of the poplar and willow,—trees which are easily propagated by slips. If you take off all the leaves of the slip as they appear, you immediately stop the development of the root, and the slip soon dies. In like manner, if you suppress the roots as they appear, the leaves die, and the same consequence ensues to the stem. After some remarks on engrafting founded upon these principles, he describes his system of pruning in the case of the poplar and the oak, which consists simply in cutting off by slow degrees the lower branches only, and close to the stem, and not pruning up to the top, which appears to be the practice in France, as it unfortunately is in this country. In the case of the oak he recommends great circumspection, and in an especial manner that no new branches should be taken off until the wounds of the previous pruning shall have been healed. M. Vetillart does not seem to be aware of the practice recently introduced into this country of shortening the upper branches, and thus promoting the growth of the leading shoot. We hope in our next Number to give the remarks on this subject of an intelligent and experienced pruner, and to show that the system of pruning, so ill understood, and imperfectly practised, may be reduced to a few practical rules, deduced from simple principles.

6. *Italian Ryegrass*—*Lolium perenne Italianum*.—This plant is said to be distinguished from the common Ryegrass (*Lolium perenne*) by its larger leaves, by its being of a deeper green, and by the greater height to which it grows. It is usually sown in autumn, as is the general practice with grass seeds in the south of Europe. After the field is harrowed, it is sown at the rate of from 16 to 18 lb. per acre, and the seed rolled in. In the following autumn the turf is covered like an old meadow, and the crop of the following year is more than double. It may be also sown in spring. If it be sown with clover or lucern, its growth is so rapid that it will quickly choke them. It is eaten greedily by cattle, whether green or dry, and yields 50 per cent. of hay. These statements are taken from the *Bulletin des Sciences Agricoles*; but we yet want more information before we can hazard an opinion upon the merits of this plant.

7. *On a supposed means of improving the Quantity and Quality of Wool.*—In a Memoir presented to the Academy of Sciences, M. Petri advances a new theory for the improvement of the wool of sheep. He contends that by frequently shearing the sheep when young, the animal fluids, which are naturally distributed between the flesh, the fat, and the wool, will be determined in greater abundance to the skin, and thus contribute to nourish the woollen fibre. He says that he has applied his principle with complete success, and

has found the quantity of the wool to be increased, and its quality and staple greatly improved. He even maintains that the improvement thus effected may be transmitted from one generation to another, and that thus whole flocks may be converted into fine-woolled animals, taking care only to reserve the animals for breeding which yield the most improved produce. We may observe, that the latter course alone would be sufficient to improve the wool of sheep to all the extent which the kind of breed will allow; and it is precisely the course to which practical breeders resort for the purpose of reproducing the peculiar qualities of animals. They select those which manifest the particular properties which it is proposed to propagate in the breed, whether that be symmetry of form and tendency to fatten, disposition to yield milk, or power to produce wool. But that the effect of such an operation as M. Petri refers to, would give a permanent character to the quality and kind of the wool to be produced in the progeny, we must beg leave to doubt. Nature, indeed, might hasten to repair the violence done to the individual animal, by renewing the fleece of which it had thus been repeatedly deprived; and, perhaps, even render its growth afterwards more close and fine. But it would require the evidence of long observation to convince us that the effect would extend beyond the poor animal which had thus been treated and had thus suffered. The period at which sheep can be shorn of their covering, is sufficiently marked by the state of the wool itself, and is dependent on climate and other circumstances. A repeated shearing of the fleece of young sheep would be a violence done to nature, and could scarcely fail to injure or destroy the health of the animals. M. Petri's supposed discovery, therefore, we hold to be a mere theory, which can lead to no useful consequences.

8. *Extraction of Potash from certain Minerals.*—This alkali, so important in the arts, may, it is stated, be extracted from minerals containing it, by a very simple process. This consists in merely calcining them with lime, and then leaving them for some time in contact with water, which is afterwards filtered and evaporated. M. Fuchs, as quoted in the *Ann. de l'Industrie*, states, that he has in this manner obtained from 19 to 20 per cent. of potash from felspar, and from 15 to 16 per cent. from mica.

QUARTERLY AGRICULTURAL REPORT.

JANUARY 15, 1831.

IN our last report we adverted to circumstances, which were calculated to enhance the prices of grain during the ensuing part of the season,—namely, the retardation of the period of harvest, the diminished stocks at home, the deficient crops in the exporting countries, the supplies required in Holland and other parts of Europe, and the defective returns of our own harvest. Upon this latter point, our information is now more precise than it could be immediately on the termination of the harvest itself. But we find, that the information which we then communicated to our readers, was, in all essential points, correct.

At the close of the harvest, the wheat crop in the principal wheat-districts of England was generally reported of favourably, being supposed likely to yield an average quantity, with a better quality than in the two preceding years. But since thrashing has become general in Essex, Kent, Suffolk, and Norfolk, the produce both in quantity and quality is found to fall short of the estimate formed. Wheat, too, in many of the inland counties, as well as in the northern districts of England, in Scotland, and in Ireland, is found to turn out greatly more defective than was anticipated. Those countries in the north of Europe from which the Baltic ports are supplied, and from which we also derive our chief supplies, appear, as well as the northern parts of France and Holland, to have suffered in the same manner, and in some cases in a greater degree than we have done, by the wet and ungenial nature of the season. The crops, accordingly, are generally reported to be not only deficient in quantity, but indifferent in quality, with the exception of some provinces of Poland, where the wheat is stated to be fine in quality, but deficient in produce. In the United States of America, the wheat is said to be good in quality as well as very productive.

Barley, on the high and early soils in England, and where it has been well harvested, is extremely good in quality, and produces the finest malt we have seen for several years. Yet the produce is not so great as was anticipated, and on all the strong clays it has proved defective. In some districts of the north of England and of Scotland, the quality

is better than was supposed, weighing in many cases from 50 to 52 lb. per bushel; but the quantity, it is believed, will fall short of the produce which the bulk seemed to indicate. In Ireland, there has been a greater extent of land under this crop than in some former years. The general produce, however, it is conceived, will prove defective as to quality, and as to quantity also in many of the northern districts. Beans and peas are both very short crops. The consumption of the former of these grains appears, from some cause not very obvious, to have fallen off in this country.

The oat crop in England is to be regarded as rather above an average in quantity, and of better quality, than for some seasons past. In Scotland, too, the crop is good; although, in the high lands, from the late and unequal period of ripening, it can scarcely be supposed to prove so productive as the bulk on the ground promised. In Ireland, at the period of harvest, it was very generally reported to be abundant in quantity, and extremely good in quality. This impression, however, is now found, in the case of many districts, to be erroneous, the return falling greatly short of the expectations entertained.

In consequence of the very small stocks of every kind of old grain at the close of last harvest in all the Continental ports, the shipments to this country previous to winter were very limited; and as the stock of free and bonded corn in Britain is now extremely small, we shall be left in a great measure dependent on our internal resources, until the arrival of foreign supplies in spring. These may, no doubt, be expected to be very extensive, from every part of Europe where a surplus exists, as well as from America; though, with respect to Europe, the supplies may, by possibility, be interrupted by the troubled state of so many countries. Upon the whole, we do not anticipate any immediate fall in the prices of grain,—which, our readers will see from the Tables, have been gradually increasing, and have recently received a farther impulse. Whatever be the amount of the spring supplies, we do not think it likely that they will produce any very powerful effect upon the market; unless, indeed, the ensuing season shall be of so favourable a nature, as to afford the prospect of a very early and plentiful harvest.

That our readers may farther judge of the correctness of the data upon which we found these opinions, it may be observed, that, on a reasonable estimate, London alone will require a supply of foreign wheat to the extent of 600,000 quarters, in order that the usual stock may be on hand at the conclusion of September next; and as the stock in all the principal consuming districts of the country is reduced in a

greater degree than even London, they will require an importation of foreign wheat in a corresponding ratio, to supply the demand. With regard again to oats, the stock of this grain in granary in London, amounted to 250,000 quarters two years ago; while, at present, we doubt if it exceeds 130,000 quarters. Nearly 800,000 quarters of foreign oats have, in the course of these two years, been entered for home consumption; thus showing, that the sales there have exceeded the supplies which have been received from England, Scotland, and Ireland, by about 900,000 quarters, being an average of 450,000 quarters annually for the two years in question. The stocks of the same kind of grain remaining in all the large consuming markets of the kingdom, are proportionally more reduced than in London, and these markets accordingly are almost entirely dependent on their weekly supplies.

The markets for fat live-stock, after a long and severely felt depression, have begun to revive. This may be ascribed to several causes;—to the action in a small degree of the rise in the price of grain; to the partial effect of the loss of sheep-stock from disease; and to the diminution of the stock on hand, arising from the forced sales and previous distresses of the tenantry: But we apprehend that the effect may be also traced to a cause more important, and likely to be more permanent—the increased consumption, arising from the better state of the labouring and manufacturing classes.

In our last and former Numbers, we directed especial attention to this subject, endeavouring to show, in opposition to an impression very generally attempted to be conveyed, that the domestic consumption of the country was in a state of progressive increase. The result of the quarter's revenue now published, bears out, in every respect, the inferences which we drew, and sets at rest a thousand false and idle tales regarding the increasing distress of the labouring population. Whatever may have been the extent of these distresses, and we have done our utmost to render their magnitude and severity known, they are assuredly not now increasing, but diminishing.

The Quarter's Revenue ending on the 5th of January 1831, shows an apparent decrease, as compared with the corresponding quarter of the year preceding, of L.29,480. There has been an increase under the heads of stamp, post-office, and miscellaneous, while there has been a decrease in the customs of L. 82,181, and in the excise of L. 37,802.

Now, regarding the excise as the branch of revenue which is indicative of the actual condition of the great mass of the people, this appa-

rent deficiency shows a considerable relative increase. In our last Number, we showed, in the face of an apparent deficiency of L.149,602, on the excise for the quarter ending 10th October, that, when the repeal of duties was taken into account, there was really an increase of L.320,398, and in the present quarter the improvement will be seen to be far greater.

The duties which were repealed during the last session of Parliament, were, as our readers know, the beer, leather, and cider duties, the amount of which, collected during the corresponding quarter of the preceding year, may be stated thus:—

Beer duty	.	.	.	.	.	L. 735,000
Leather duty	.	.	.	.	.	117,000
Cider	.	.	.	.	.	3,500
In all						<hr/> L. 855,500

From which there will fall to be deducted
the additional duty which was laid on
spirits, which may be stated, in round
numbers, at L.150,000

And the actual deficiency on the present
quarter of

37,802

In all

L. 187,802

Leaving, of actual increase on the other branches of
excise for the quarter, L. 667,698

This result must be regarded as proving incontestibly the increasing consumption of commodities among the population of the country, and justifies all the anticipations which we ventured to hold out regarding the improving state of the industrious classes, and the unimpaired resources of the nation.

Were there no other evidence than this, it would justify us in awarding praise to the ministry of the Duke of Wellington, for their administration of the public revenue. This we asserted when it was the fashion to revile them, and we now assert, that no ministry ever carried into effect a salutary economy, in all the branches of the national revenue, with more integrity, firmness, and prudence. They have left to their successors in office the easy duty of realizing the benefit; and it would seem, that, in some cases, the disposition is not wanting in their

successors to claim the merit. The first great act of the new administration—a necessary act we allow—that of adding largely to the military forces of the country, has been to admit that their own censures of extravagance and venality in their predecessors in office, were false,—and that retrenchment had been carried to its utmost limits. They who form the existing ministry now find themselves under the mortifying necessity of leaving unredeemed pledges which, in the rashness of party spirit, they had given; and of combating that delusion which they themselves had been so willing to excite. The idea of relieving the distresses of the country by any saving which, in the present state of the finances, is practicable, must seem absurd to any man in the least acquainted with the sums that can be so saved; and yet the delusion is not the less dangerous because it is absurd. It has been one of the most powerful engines, we have seen, that has been given to traitors at home, to work upon the fears and evil passions of the ignorant. Frugality is a duty which every just government owes to the State; but assuredly frugality alone is not the panacea which it has been held out to be,—as we may see from this, that thirty millions of taxes per annum have been reduced since the year 1814, and yet that the effect produced has not been that which we were confidently assured was capable of being produced by the clipping off of a few hundred thousand pounds more from the necessary expenditure of the country. This absurdity, of which such a dangerous use has been made by the seditious press of the country, must now of necessity be abandoned by the present Government. In place of this, however, we shall be told perhaps, that it is not the mere lessening of taxes—the mere saving—but a change in their nature and direction, or, in other words, a *financial reform*, as it is called, that is to repair all the evils of the country. We distrust this panacea even more than the other; and if this is to be the tub thrown out to the English whale, we must say that we anticipate little good from the forthcoming *financial reform*. Few appeals, we formerly observed, to popular feeling, are more generally successful than those which relate to a reduction of taxes; and yet a reduction of taxes, as much as the imposing of them, often involves considerations of great difficulty. Not a tax can be changed without affecting the subsisting relations of capital in some branch or other of industry and trade. It is in the highest degree important, therefore, to give steadiness and consistency to any system of fiscal regulation; and when changes are resolved upon, that they be carried into effect with as little displacing as possible of capital from its established channels. To do otherwise is unjust to the capitalist,

and injurious to industry ; and those who approve of great and sudden changes in finance, show themselves to be little conversant with practical business. Whatever reformation, then, our fiscal code may demand, we hope to see it carried into operation temperately,—for then only will it be done wisely.

With a revenue increasing in one of its branches alone at a rate of more than L. 2,000,000 Sterling a-year, little else seems necessary to be done than to proceed gradually to lighten the pressure of taxation where it is the most heavy upon the springs of public industry and private enjoyment. By a steady course of this kind, we shall far more certainly arrive at the object of improving the resources of the country, and increasing the comforts of the people, than by seeking to abuse them by a few nostrums of finance. We are the more induced to advert to this subject, because the very first financial act of the new government, is one which betrays great rashness, to say the least of it. This is the repeal of a duty on a foreign commodity, which will have the immediate effect of reducing thousands of poor oppressed people to utter want. The taking off of the duty on Barilla, which necessarily detroys the entire kelp manufactures of the country, by an order in council, without the sanction of Parliament, and without communication with the suffering parties, does not, we conceive, argue favourably of the temperance at least with which the financial schemes of the day are to be carried into execution. In all our past discussions on such subjects in this Journal, we have shown how warmly and consistently we have supported freedom of trade, wherever the application of the principle is practicable, and consistent with the great interests of the nation ; but we would never dream of applying an abstract principle without regard to those necessary limitations which its application demands in the case of a great country. This sort of political wisdom may be left to the M'Cullochs of the day. A repeal of the duty on barilla, a substance the material of which enters into so many manufactures, may be conceded to be wise in principle even by those who will not admit that it was either just or wise to do so without reference to any of the consequences—the most melancholy of which is, that more than 100,000 industrious and helpless persons in Great Britain and Ireland, will be deprived at once of the very means of earning their subsistence, and thousands of poor families compelled to abandon their native shores for ever. This act, we say, is one too rash and heartless to be approved of by the sober judgment and right feeling of the country.

It is not, however, by one act,—by one ill-considered act,—that we

are to judge of the merits of his Majesty's government. There are members of it, we feel, who would be the last to sanction what is rash, cruel, or unjust. His Majesty's government are entitled to every fair trial which they can demand from the justice of the country; and we feel assured that the full disposition exists to give them the trial. There has been already, however, we must observe, enough of jobbing, both in England and Scotland, to stagger a little the faith of their warmest friends. *Res duræ, et regni novitas*, may be pleaded within reasonable limits, and the answering the claims of a few needy dependents may be tolerated to a certain extent: but there are limits to indulgence of this kind; and they who have censured, without bounds, the conduct of others, may now expect that a strict accordance between their professions and their actions will be demanded by the country.

Two subjects we had intended for particular discussion,—the *first*, the question of the Corn Laws, with a view to consider the practical operation of the existing system; but the declaration of Earl Grey, that, however desirable a revision of the present system is, it is not the intention of his Majesty's ministers to bring forward the subject at present, releases us from the task we had imposed upon ourselves of adverting to it at length in the present Number. The *second* subject on which we had proposed to offer some observations, but on which we will not now enter, is the melancholy one of those attacks upon farming property which have disgraced the period of the last three months. It is distressing to think that a time of reviving industry should have been marked by horrors and outrages, which, if not repressed by the power of the law, must have destroyed industry, law, and liberty in England. It is to be hoped, however, that this career of violence and crime,—a reproach to the police of the country,—will be no longer submitted to. The destruction of machines, as a means of raising wages, has ever been a favourite fancy with the most ignorant of the multitude; but the destruction of property by the hands of midnight incendiaries, would present a feature of blind ferocity even in domestic tumults, which we would have a right to regard as evidence of the entire demoralization in the great mass of our countrymen, were it not apparent that the deluded peasantry have been made the dupes of a long train of falsehood and misrepresentation, and that the real actors in the outrages are comparatively few. That the great loss of farming capital, within these last five or six years, has greatly lessened the means of farmers to employ labourers, is certain; but it does not in the least appear from the depositions of witnesses at the trials, and the admissions of the culprits, that the people had been acting under the

pressure of present want. We trust, however, that this effect will result,—that even those poor people will be taught to see that they will not be suffered to violate the rights of their countrymen, either in the lawful employment of thrashing machines, or any other property. And we trust that magistrates will also have been taught the danger and the wrong of yielding to intimidation and threats where their duty is to protect, at every hazard, the rights and liberty of the subject, and that they will never again attempt the ridiculous task of regulating the wages of labour. They may rest fully assured, that the circumstances which determine the wages of labour, and the happiness of the labourer, lie far beyond the petty enactments of the Quarter Sessions.

TABLES OF PRICES, &c.

The Average Prices of the different kinds of GRAIN, per Imperial Quarter, at following Markets :—

LONDON.						
Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1830.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Oct. 18.	63 2	35 10	27 6	34 6	41 0	40 0
25.	63 6	36 11	27 6	34 0	41 2	40 0
Nov. 1.	63 7	37 10	26 3	33 6	40 6	39 6
8.	62 10	37 10	25 6	34 6	41 6	40 0
15.	65 4	40 6	25 4	34 8	42 6	40 2
22.	64 10	37 9	26 8	34 8	42 6	40 6
29.	67 4	40 8	25 4	35 4	43 6	40 6
Dec. 6.	67 1	40 11	24 3	35 10	44 6	40 0
13.	69 1	40 10	24 1	36 4	45 6	40 2
20.	69 3	39 7	24 5	37 0	46 0	40 6
27.	70 8	39 9	25 0	37 10	46 6	40 0
1831.						
Jan. 3.	70 4	40 6	26 8	38 6	46 10	40 2
10.	71 6	40 3	26 8	41 2	46 0	38 6

LIVERPOOL.						
Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1830.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Oct. 12.	62 4	33 1	30 1	33 8	40 6	39 8
19.	61 5	33 0	25 6	33 0	40 8	39 0
26.	58 6	42 8	26 0	32 6	40 0	38 6
Nov. 2.	58 4	37 2	23 3	32 8	40 4	39 0
9.	57 11	36 6	24 0	33 0	40 6	39 6
16.	59 8	37 6	24 0	33 4	41 0	39 9
23.	61 10	39 9	23 8	33 8	41 2	39 6
30.	61 5	37 2	24 2	34 0	41 8	39 2
Dec. 7.	62 0	39 0	24 9	34 4	42 6	39 0
14.	64 9	42 0	25 2	34 6	43 0	38 6
21.	65 10	43 6	26 0	35 0	44 0	38 0
28.	67 3	45 0	26 6	36 6	44 6	38 6
1831.						
Jan. 4.	66 1	38 4	25 10	36 6	42 0	37 0

HADDINGTON.						
Date.	Wheat.	Barley.	Oats.	Pease.		
1830.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Oct. 22.	61 3½	31 1	24 11½	30 0		
29.	63 9	32 3½	25 7½	30 0		
Nov. 5.	62 5½	32 3	24 1½	30 0		
12.	60 3	32 5½	23 8½	30 0		
19.	58 0	31 9½	24 4 ½	30 0		
26.	57 10½	31 2	25 2 ½	30 0		
Dec. 3.	57 2½	29 9½	24 4 ½	30 0		
10.	56 11½	30 7½	24 1 ½	30 0		
17.	55 9½	32 0½	24 1 ½	30 0		
24.	60 11½	32 7½	25 1 ½	30 0		
31.	60 7½	32 8½	25 9½	30 0		
1831.						
Jan. 7.	60 5½	34 5	26 4 ½	30 0		
14.	61 3½	37 8½	26 7 ½	30 0		

EDINBURGH.						
Date.	Wheat.	Barley.	Oats.	Pease.		
1830.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Oct. 20.	63 6	32 4½	25 3 ½	40 2		
27.	67 3	33 13	24 7½	40 0		
Nov. 3.	61 6	33 9	24 8½	39 0		
10.	64 9	33 6	24 6 ½	39 0		
17.	65 6	33 4	24 4 ½	39 0		
24.	60 0	31 9	23 7 ½	39 0		
Dec. 1.	61 1½	32 5	25 0½	39 0		
8.	56 9	31 9	24 2 ½	37 0		
15.	58 6	31 10	24 6 ½	37 0		
22.	50 3	32 2½	24 3 ½	37 0		
29.	60 9	33 9	25 1½	40 0		
1831.						
Jan. 5.	62 9	34 5	25 6½	41 0		
12.	62 5½	33 9	25 2½	41 9		

MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, showing the Quantities of Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; the Quantities upon which duties have been paid for home-consumption, during the same Month; and the Quantities remaining in Warehouse at the close thereof: from 1st September to 1st December 1830.

No.	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN WAREHOUSE.		
	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.
1.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
...	344,888 4	6,396 5	355,285 1	929,739 0	4,256 0	937,998 0	11,474 3	33 7	11,508 2
...	20,858 3	...	20,858 3	13,686 6	...	13,686 6	146,543 0	...	146,543 0
...	182,394 4	...	182,394 4	504,871 5	...	504,871 5	4,077 1	...	4,077 1
...	22,580 1	...	22,580 1	16,188 2	...	16,188 2	29,813 5	...	29,813 5
...	6,140 6	461 4	6,592 2	15,729 7	753 6	16,483 5	2,085 5	...	2,085 5
...	3,260 0	...	3,260 0	11,897 3	...	11,897 3	2,450 6	...	2,450 6
...	3,085 7	...	3,085 7	1,615 0	...	1,615 0	1,521 2	...	1,521 2
wheat,	4 0	...	4 0	4 4	...	4 4	137 4	...	137 4
...	587,212 1	6848 1	594,060 2	1,427,337 3	9,009 6	1,506,947 1	198,113 2	33 7	198,147 1
...	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
...	49,023 3 6	6,967 3 12	56,011 2 18	358,115 1 6	6,967 3 12	365,103 0 18	11,638 3 27	94 3 23	11,733 3 22
...	45 0 0	17 3 18	62 3 18	...	17 3 18	17 3 18	...	...	...
...	49,068 3 6	7,005 3 2	56,074 2 8	358,115 1 6	7,005 3 2	365,121 0 8	11,638 3 27	94 3 23	11,733 3 22
...	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
...	66,664 5	1,138 0	67,802 5	7,461 4	145 0	7,606 4	51,069 6	690 7	51,760 5
...	15,585 2	...	15,585 2	4,407 4	...	4,407 4	156,639 6	...	156,639 6
...	65,314 2	...	65,314 2	49,540 3	...	49,540 3	15,204 5	...	15,204 5
...	5,233 7	...	5,233 7	104 3	...	104 3	24,116 7	...	24,116 7
...	611 4	...	611 4	2,750 4	...	2,750 4	258 4	...	258 4
...	4,255 2	...	4,255 2	818 3	...	818 3	5,883 5	...	5,883 5
...	3,189 1	...	3,189 1	525 0	...	525 0	4,190 2	...	4,190 2
wheat,	...	...	...	...	...	...	137 4	...	137 4
...	160,923 7	1,138 0	162,061 7	65,607 5	145 0	65,752 5	267,511 7	690 7	268,208 6
...	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
...	94,221 0 13	2,640 2 27	96,861 3 12	2,065 2 27	341 3 26	2,397 2 25	22,588 3 11	2,391 3 24	24,980 3 7
...	30 0 0	487 3 23	517 3 23	...	487 3 23	487 3 23	1 3 0	...	1 3 0
...	94,251 0 13	3,128 2 22	97,379 3 7	2,065 2 27	829 3 21	2,895 2 20	22,580 2 11	2,391 3 24	24,962 2 7
...	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
...	29,401 52	2,625 4	32,027 13	1,716 24	12,067 7	2,923 13	78,116 04	2,444 1	80,560 14
...	4,479 62	...	4,479 62	8,258 34	...	8,258 34	154,343 1	...	154,343 1
...	6,509 6	...	6,509 6	118 3	...	118 3	20,606 04	...	20,606 04
...	760 0	...	760 0	83 5	...	83 5	16,359 7	...	16,359 7
...	195 12	70 0	265 12	17 12	70 0	87 13	436 44	...	436 44
...	10 74	...	10 74	5,092 24	...	5,092 24	802 2	...	802 2
...	...	...	...	61 1	...	61 1	4,150 2	...	4,150 2
wheat,	...	...	...	...	...	...	137 4	...	137 4
...	41,357 32	2,695 4	44,052 71	15,347 23	1,276 7	16,624 14	274,951 54	2,444 1	277,395 65
...	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
...	52,963 3 7	6,569 2 7	60,853 1 14	14 1 13	1,035 2 1	1,049 3 14	70,797 0 15	9,924 1 2	80,721 1 17
...	0 2 12	...	0 2 12	0 2 12	...	0 2 12	1 3 0	...	1 3 0
...	52,294 1 15	6,569 2 7	60,853 3 26	14 3 26	1,035 2 1	1,050 1 26	70,798 3 15	9,924 1 2	80,723 0 17

SUMMARY of the Importation of Foreign Corn since September 1830.

IMPORTED.

During the Month of	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.	Maise.	Suck-wheat.
	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
September,	355,283 1	20,858 3	182,304 4	22,580 1	6,592 2	3,260 0	3,085 7	4 ..
October,	67,812 5	15,515 2	63,314 2	5,233 7	681 4	4,255 2	3,189 1	.. ..
November,	38,127 11	4,479 6	6,549 6	780 0	285 11	10 7	.. ..	.. ..
Totals, .	455,114 71	40,923 3	254,218 4	28,574 0	7,558 71	7,625 11	6,375 0	4 ..

PAID DUTY FOR HOME CONSUMPTION.

During the Month of	Wheat.	Barley.	Oats.	Rye.	Pense.	Beara.	Malce.	Buckwheat.
	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
September,	937,988 0	13,898 6	508,871 5	16,188 2	16,493 5	11,897 3	1,615 0	Qrs. B.
October,	7,606 4	4,407 4	49,540 3	104 3	2,750 4	818 3	525 0	4 4
November,	2,923 1	8,258 3	118 3	83 5	87 1	5,092 2	61 1	..
Totals, .	948,517 5	26,564 5	558,530 3	16,376 2	19,321 2	17,908 0	2,201 1	4 4

TABLE showing the Weekly Average Prices of all kinds of GRAIN, made up in 1831, from the 7th and 8th Geo. IV. c. 58, and the Aggregate Averages which regulate the Duties on FOREIGN CORN; and the Duties payable thereon, from 16th October 1830 to 1st January 1831.

Date.	Wheat.			Barley.			Oats.			Rye.			Pease.			Brs.		
	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.
1830.	63	d.	d.	62	d.	d.	10	d.	d.	34	d.	d.	41	d.	d.	4	d.	d.
Oct. 22.	63	6.81	8.25	62	6.35	7.34	0	10	10	34	8.10	8.10	41	6.33	7.7	4	6.33	7.7
29.	61	6.61	8.25	62	6.35	10.34	0	10	10	23	8.24	8.10	39	6.33	7.7	4	6.33	7.7
Nov. 5.	61	3.61	9.25	62	11.35	11.35	1	9	4	22	10	9	34	1.33	11	19	9.42	9.41
12.	63	9.62	3.34	62	8.38	0.36	3	10	23	6	23	8.12	33	3.34	7.18	34	11.42	8.6
19.	64	8.62	7.34	62	8.38	4.36	9	9	4	23	6	23	3	3.34	7.18	34	11.42	8.6
26.	64	8.63	0	23	8.38	7.37	3	6	6	4	23	5	12	3.34	7.18	34	11.42	8.6
Dec. 3.	63	7.63	8	23	8.38	0.37	7	6	6	4	23	5	12	3.34	7.18	34	11.42	8.6
10.	66	1.64	6	22	8.37	6.37	11	5	4	35	3	23	3	3.34	7.18	34	11.42	8.6
17.	67	1.63	3	21	8.37	4.37	11	6	4	24	3	23	3	3.34	7.18	34	11.42	8.6
24.	67	7.65	11	21	8.37	11.37	11	6	4	24	3	23	3	3.34	7.18	34	11.42	8.6
31.	68	1.66	6	20	8.38	1.37	10	6	4	24	3	23	3	3.34	7.18	34	11.42	8.6
1831.																		
Jan. 7.	68	3.67	1	18	8.38	4.37	10	6	4	24	3	23	10	3.42	2.39	7	11	0

PRICES OF BUTCHER-MEAT.

	SMITHFIELD, Per Stone of 14 lb.		MORPETH, Per Stone of 14 lb.		EDINBURGH, Per Stone of 14 lb.		GLASGOW, Per Stone of 14 lb.	
Date.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
Oct.	4/3 @ 7/3	4/ @ 6/6	4/6 @ 5/6	4/ @ 5/6	4/3 @ 5/6	4/3 @ 5/3	4/6 @ 5/6	4/6 @ 5/6
Nov.	4/6 7/6	4/3 5/9	4/8 5/9	4/3 5/9	4/6 5/9	4/6 5/6	4/9 5/6	4/9 5/6
Dec.	4/8 7/9	4/6 7/3	4/9 6/	4/6 6/	4/9 6/3	4/9 5/9	4/9 5/3	4/9 5/6

PRICES of English and Scotch WOOL.

ENGLISH, per 16 lb.—*Merino*, Washed, 21/ @ 28/; in Grease, 14/6 @ 18/6.—*South Down*, 15/ @ 20/6; *Leicester Hog*, 14/ @ 18/; *Ewe and Hog*, 13/6 @ 18/.—*Moor*, *Ewe and Hog*, 8/ @ 9/6.

SCOTCH, per 16 lb.—*Leicester*, *Hog*, 17/ @ 20/; *Ewe and Hog*, 14/ @ 16/6.—*Cheviot*, *Hog*, 13/ @ 14/.—*Ewe*, 11/ @ 14/.—*Moor*, *Ewe and Hog*, 7/6 @ 10/6.—*Cheviot laid* per 24 lb 12/6 @ 16/.—*Moor*, 7/ @ 9/6.

THE REVENUE.

ABSTRACT of the Net Produce of the Revenue of Great Britain, in the Years and Quarters ended on the 5th January 1830 and 1831, showing the Increase and Decrease on each head thereof.

	Years ended January 5.		Increase.	Decrease.	Quarters ended January 5.		Increase.	Decrease.
	1830.	1831.			1830.	1831.		
	£	£	£	£	£	£	£	£
Customs, . . .	16,023,890	16,343,561	319,701	..	3,851,876	3,709,695	..	82,181
Excise, . . .	17,449,721	16,695,775	..	853,946	4,669,020	4,831,220	..	37,808
Stamps, . . .	6,644,833	6,505,291	..	39,344	1,556,573	1,586,663	27,110	..
Post-Office, .	1,735,000	1,359,011	..	17,988	321,000	330,905	9,005	..
Taxes, . . .	4,896,768	5,013,405	116,639	..	617,073	2,062,030	44,955	..
Miscellaneous,	44,001	283,390	..	165,711	2, 71,968	01,401	9,433	..
	47,130,673	46,499,423	436,540	1,076,190	12,889,514	12,660,034	90,503	119,968
Deduct Increase, .	..	..	..	436,540	Deduct Increase, . .	..	..	90,503
Decrease on the year,	..	..	£ 640,450	..	Decrease on the quarter,	..	..	£ 29,480

FOREIGN CORN MARKETS.

THE unfortunate result of last harvest, added to the acknowledged deficiency of stock of old corn in this country, has caused great speculation in all the Continental markets, and very extensive orders have been transmitted during winter to almost all the shipping ports in the Baltic. Many of these orders indeed were without limit, so impressed are the speculators with the idea, that much foreign corn will be required to meet the wants of this country, before we can reap another harvest. Such orders as have gone out with a limit, have generally not been executed, while those unlimited have been fulfilled at very high prices, say 10/, and in some instances 15/ 3/4 quarter beyond the rate at which it was expected wheat would have been obtainable.

How far the generally favourable feeling as to the future course of prices may be realized, is yet to be ascertained; but circumstances, we think, rather favour such an advance as to enable the importer to relieve the bonded wheat at the nominal point in the course of spring, which will probably tend to keep prices in check, and so prevent them from reaching a much higher point than they have already attained. We have already given an impartial, and we believe a tolerably correct, state of the yield of last harvest in many parts of the Continent; and we must regret that every further infor-

mation we receive on the subject leads us to believe that we have rather over-estimated the crops than otherwise. We give the following extracts from advices which we have received from time to time during the last three months.

HAMBURG.—Every pains having been taken to procure the most comprehensive and particular information of the crops in the surrounding country, we think we are fully warranted in taking the following view of the subject.

Wheat, in point of quantity, is certainly below an average crop, as many grains were beaten out in the fields by the constant and heavy rains. In Magdeburgh and the Saale, the wheat is much sprouted, and generally in poor condition, though probably about one-third part has been got in fine, reaching 58 lb. 59 lb. and 60 lb. per bushel imperial. Although in Mecklenburgh it is said some good wheat has been saved, yet not a single bushel of good grain has appeared from this district, which usually supplies us with the first new wheat.

Holstein has suffered severely, though a few good samples have appeared from thence, which gives hope that some good wheat may be selected with care; the quantity, however, can only be trivial. From Silesia we have reason to expect the best wheat, the harvest having been nearly completed during the interval of fine weather in July. The stocks of old corn are quite reduced, and prices of the new may be noted as follows :—

Wheat, best white, - - - - -	52/ @ 55/
Anhalt, red, - - - - -	48/ @ 52/
Mecklenburgh and Holstein, - - -	45/ @ 48/
Danish, red, - - - - -	42/ @ 44/
Barley, Anhalt and Saale, - - - -	25/ @ 26/
— Mecklenburgh and Holstein, -	20/ @ 22/
— Danish, - - - - -	18/ @ 20/
Oats, Upland Mecklenburgh, - - -	20/ @ 22/
— Danish, - - - - -	13/ @ 16/
Beans, small, - - - - -	30/ @ 31/
— large, - - - - -	29/ @ 30/
Pease, white boilers, - - - - -	30/ @ 33/

COPENHAGEN. KIEL. DANISH ISLANDS. In Holstein, Schleswig, and the Danish Islands, all the farmers are agreed, that they never experienced a more unfavourable harvest, or one that required greater exertion to save their grain from a total loss. There was one thing, however, greatly in their favour,—the coolness of the atmosphere; and to this is to be attributed the comparatively little damage which the crops suffered from the heavy and continued rains to which they were so long exposed. The intervals of fine weather were so few, and of such short duration, that the number of labourers was totally inadequate to the work, and in many instances the grain was carried home during the night; hence it arises, that the corn has suffered less on the small farms than on the large estates, where population is comparatively smaller. In low and sheltered situations there has been much sprouting, but the more open and exposed grounds have escaped this evil. It is indeed matter of astonishment to the farmers themselves, that the general quality

and soundness of the grain should have suffered so little from a season of such unexampled wetness.

The quantity produced varies considerably in different districts, but we believe the following to be a pretty correct estimate of the produce of the Danish States.

Wheat is under an average crop by one-fourth,—the colour pretty good, and quality generally superior to that of last year. Barley has yielded a fair crop, the quality unequal, but some good grain may be selected. Oats may be taken at a fair average produce;—they are not, however, good in colour, but in other respects they are sound, and will weigh pretty well when divested of their moisture. Rye is a decided failure, and cannot be rated at more than a third of an average. Importations of this grain from the higher Baltic Ports have been greater than has been known for many years. Pease and beans are below an average, and the quality generally inferior.

From the foregoing statement it will appear, that the harvest has been defective to a considerable degree, and that the deficiency lies chiefly in those descriptions of grain, which form the staple consumption of this country. Rye and buckwheat, which are generally used in great quantities by the distillers, as well as for food, are inadequate to the wants of the inhabitants. Wheat and barley must therefore be substituted for them, and as the demand for these will consequently be augmented, it is more than probable, that under any circumstances, prices will range above their usual level during the season.

To relieve, in some degree, the heavy pressure upon the lower order, the Danish Government has found it expedient to suspend the Impost-duty on Rye till the 1st of July next. The great bar to speculation at present, is the inferior condition of the grain, which renders it unfit for immediate shipment to distant ports. Before the spring it will probably be improved in this respect, and shipments may then be made with confidence.

Current Prices.

Wheat,	- - -	38/ @ 42/	Rye,	- - -	32/ @ 34/
Barley,	- - -	18/ @ 21/	Pease,	- - -	30/ @ 34/
Oats,	- - -	14/ @ 16/	Beans,	- - -	25/ @ 28/

Rosstock.—The unfavourable weather during seed-time, and for a long time thereafter, made us anticipate an inferior growth, and fears were entertained even of a total failure of the crop. These fears were somewhat abated by a short interval of fine weather, but this being succeeded by cold and rain while the plants were yet in bloom, they received a check from which they could not afterwards recover. In short, the idea that it was impossible that we could have an abundant harvest became so prevalent, that our prices gradually advanced, and remained firm even after reports from foreign markets became less encouraging. Our expectations have been realized. According to the best estimate which we can form, the crop of rye in our neighbourhood will not exceed one-half, and that of wheat two-thirds, or at most three-fourths, of an average crop. The quality of the latter will be very various, as the higher districts have had a decided advantage over the lower; at the same time, with proper exertion, we have no doubt we shall be able to select, during winter, many parcels of good quality. The weight, however, will not be

equal to that of last year; and we can hardly expect it to exceed 48 lb. per bushel imperial. Rye weighs about 55 lb. to 57 lb. per bushel. The harvest of spring corn has produced a much more satisfactory result, as well with regard to quantity as quality. Oats are of finer quality than they have been for some years,—the colour good, and they weigh from 36 lb. to 38 lb. per bushel.

Barley weighs from 53 lb. to 54 lb. per bushel. Pease have a fine appearance, and prove to be of good quality. It is yet impossible to state how prices will rule. We may, however, expect that wheat of good quality will be bought at prices equal to 40/ to 44/; barley at 18/; Oats, 14/ to 16/; and pease 28/ to 30/ per quarter free on board. Our market is not at present well supplied, the necessary occupations of our farmers preventing them from bringing forward their grain for sale; but by-and-by, we shall have better arrivals.

There is every reason to expect we shall have a brisk trade next season, for our stocks are completely exhausted; and as harvest has, in almost every country, proved to be materially deficient, speculation will probably be kept alive, and our supplies will readily find buyers.

DANTZIG.—Our supplies have ceased, and our stocks in granary are next to nothing. Whether at any time our intercourse with Poland may be reopened, it is impossible to say; at all events, no fresh supply can be expected before April; and even at the present high prices, there are orders in town from all quarters. It is our firm conviction, that prices cannot decline, even if our stocks should undergo a check. We have had a large crop of pease, comparatively speaking, but the greater part has been already shipped off, so that it would be perhaps difficult to collect 50 lasts until the spring; the present price for yellow is 27/ per quarter, and white are not to be had under 24/ to 25/. We think these currencies will be kept up. Upon the whole, very little business can be done here during this winter. We want large supplies of ordinary wheats, but we cannot execute the orders in town, say with limit at 45/.

We may have some supplies of such wheats by land-carriage in February, but the quality is exceedingly poor, sprouted and light, and it will require much skill to make the parcels shippable when the navigation opens.

The wheat crop in our neighbourhood is nearly a failure; and it is a great misfortune that the late occurrences have thrown impediments to our operations in Poland, where the crop is better than for several years past.

Our river being covered with ice, the supplies riverwise have ceased, and our trade is confined to granary samples, very few of which, are offered for sale.

Current Prices.

Old Wheat, fine high mixed, 60/ @ 62/	Rye, - - - 28/ @ 30/
— second sort, - 57/ @ 60/	Barley, - - - 18/ @ 20/
— fine mixed, - 54/ @ 56/	Pease, yellow, - 27/ @ 28/
— second sort, - 51/ @ 53/	Do. white, - 25/ @ 27/
— red mixed, - 49/ @ 50/	Oats, - - - 10/ @ 12/
— ordinary, - 45/ @ 46/	

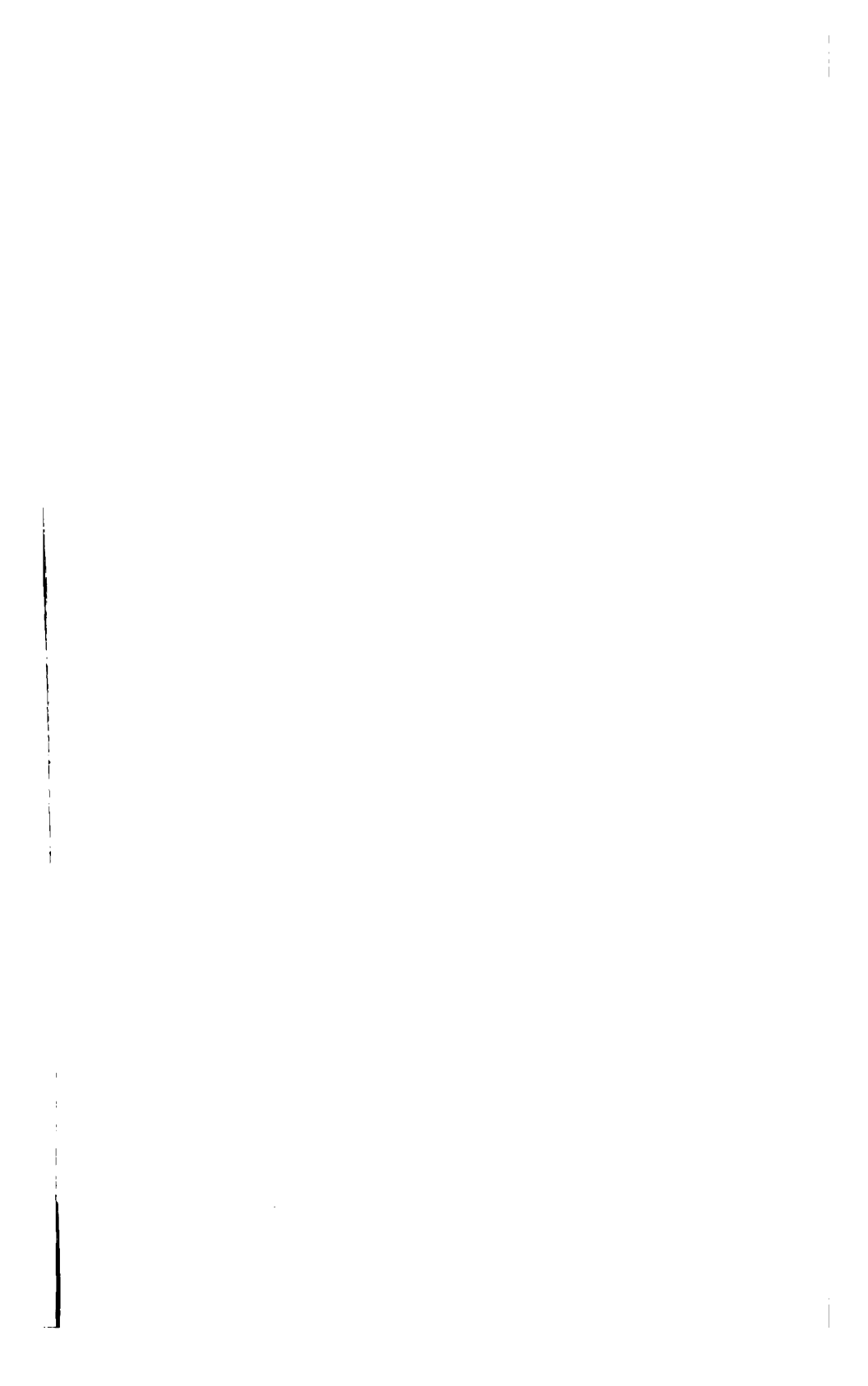
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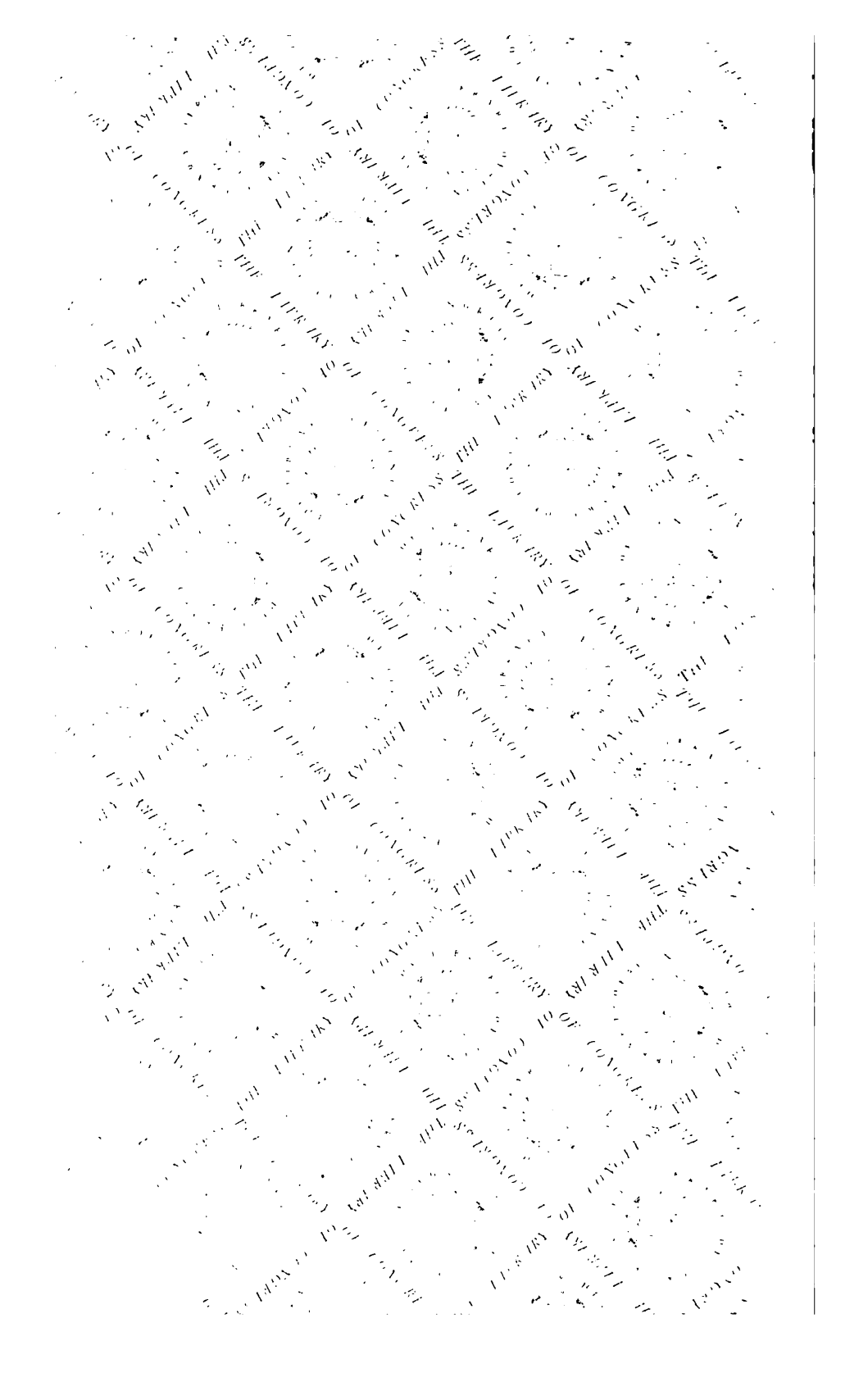
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